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Vol. V. NEW YORK, MARCH 21, 1885. No. 12.

Handsomely bound volumes of THE ELECTRICAL WORLD *for* 1884 *are now ready, and will be sent, charges prepaid, to any address on receipt of* $5.00.

MURMURS of discontent among telegraph operators may not be very loud just now, but no mistake is possible as to their depth and bitterness.

THE proposal of Senator Daly, of this State, for the appointment of a commission to enforce the underground wire law, passed last year, is not relished by the companies interested, especially as it calls for an assessment on them of $10,000 to meet the annual expenses of the commission.

THE quarterly dividend of the Western Union Company is 1½ per cent., payable to about 4,500 stockholders. There are not wanting critics who allege that the directors have no right to declare a dividend at all, and that it will leave the company deeper in debt; but the figures show a slight increase in the surplus. The prophecy is also made that the present action having served its purpose, the next dividend will be passed.

ELECTRICITY is playing a prominent part in the Soudan campaign. The cables have been in incessant use, telegraphers have been shipped out to Egypt from England by the score, and now the work of construction on the Suakim-Berber railroad is to be accelerated by the use of the electric light. It will be remembered that at Suakim already the electric light has been effectively employed as an auxiliary in preventing and defeating night attacks by the Arabs.

AN Italian contemporary informs its readers that in America there have been so many premature interments that it is proposed to establish telephonic communication between the principal exchanges and the coffins of doubtful cases. It has only told half the story, as communication has been established also with the next world, by many of the leading Spiritualists of this country. Our contemporary should know that half-way measures never satisfy Americans.

TIMES are not yet on the mend quite as cheeringly as they might be, but most of the New York stock brokers feel that they can afford to rent "tickers" at $10 and $15 a month, the rates now charged for down-town and up-town service. It is said that the reduction means a loss of income to the Gold and Stock Company of about $240,000, as they have about 1,600 instruments in use in this city for stock quotations. How long the competition and cutting will go on nobody knows, but all concerned profess their readiness and ability to stand a long struggle.

AS it seems likely that during the present political troubles in Central America, the submarine cables of the Central and South American Telegraph Company will be tampered with and damaged, Mr. Whitney, the Secretary of the Navy, has instructed Commander Mahan, of the "Wachusett," now at Panama, to make vigorous protest against any attempts of the kind by the government of Guatemala or its emissaries. It is worthy of note that the cable has been of good service in blocking the efforts of President Barrios, of Guatemala, to render himself dictator of Central America.

ONE of the chief officials of a New York Gas Company stated before the Investigation Committee, now inquiring into gas matters, that the thought of the danger from leaky mains often kept him awake o' nights. Some of the consumers attribute his sleeplessness to an uneasy conscience in regard to high rates, but the avowal is not calculated to reassure timid householders. In Chicago, too, it is said that the gas mains have broken frequently this winter, with resultant leakage and explosions. On the score of safety we would far rather have to deal with electric light wires than gas mains or oil cans.

FINDING that their heavy submarine lines in the River Mekong were regularly carried away by the floods, the French administration in Cochin China have resorted to the use of overhead wires. Posts 165 feet high have been put up on each side of the river, at a spot where the width is 2,560 feet, and from these silicious bronze wires, one .04 inch and the other .055 inch in diameter, have been suspended across the stream. Over a tributary of the river another similar connection has been made, 1,670 feet span, and more than 114 feet above flood water. The silicious bronze wires are reported to be giving admirable service.

IN our columns to-day will be found a brief quotation from the eloquent and stimulating address delivered before Johns Hopkins University last month by its president, Dr. Gilman, on the benefits that civilization derives from universities. The "case" for higher education has rarely been so ably presented. We are glad to see that Dr. Gilman emphasizes the importance of the laboratory work done in universities, as it is to them we must look for unselfish experiment, wisely directed and never remitted, in vast departments of research that fail otherwise to attract attention and investigation, but are all-important to the progress of knowledge.

WE would direct special attention to the article in this issue on the Edison electric light installation at the New Orleans Exposition. The cut accompanying it is an exact reproduction of the foundation plans made for this admirable construction. We are indebted for it to Mr. Henry M. Byllesby, M. E., the engineer under whose able management the station was designed and constructed. The design and its successful execution show, we think, that Mr. Byllesby possesses in the highest degree the experience, talents and energy requisite to the electrical engineer of to-day. Great praise is also due to Mr. Stieringer, who was associated with Mr. Byllesby in the work, and who is well known among electricians. The two gentlemen put in plants of the Edison Company at the Louisville and St. Louis Exhibitions, last year, with perfect success.

WE are in receipt of the annual report of the Board of Commissioners of the Michigan School for the Blind, where the superintendent, Mr. J. F. McElroy, A. M., has introduced the Edison light. The installation of an isolated plant was completed in February, 1884, and the results so far have been very satisfactory, showing that the electric light is as good for the blind as for those who can see. Mr. McElroy says: "The points of advantage which it possesses over any kind of gas light are numerous and important. Among them we will mention its great steadiness, its entire freedom from the dangers of fire, and the effects of its accidental escape into the room which attend the use of gas, the easiness of control, its great cheapness, its slight heat, and absolute freedom from vitiation of the air." Mr. McElroy shows a cost, including interest, of 18½ cents for running 98 lamps for one hour, based on the average use of 98 sixteen candle-power lamps 5½ hours daily.

IT appears that a telephone lineman making repairs on top of a pole in Philadelphia, during the daytime, this week, had his fingers burned and his life imperilled by contact with an electric light wire. "Thinking it perfectly safe in daytime, he caught hold of an electric light wire." We are very sorry to learn that, in consequence of this act, one finger was "burned entirely off," and that another finger and the thumb have been amputated, but we hardly see how any one save the man himself is to blame. They who are willing to take these chances can find plenty of opportunities every day, in great cities, for endangering life and limb. The man could not, and does not, plead ignorance of the nature of the current traversing an electric light wire, and he was under no necessity whatever to touch the wire in question, of whose identity he was well aware. There are innumerable instances on record of men sacrificing life because they did things that they thought were safe, but the world at large is not deprived of its benefits and conveniences on that account.

A DEMOCRATIC Patent Office Commissioner has been appointed in the place of Mr. B. Butterworth. We are anxious to see how the new man, Mr. Martin Van Buren Montgomery, of Michigan, meets the responsibilities of his important office, under the changed political conditions. Mr. Butterworth gave satisfaction, on the whole, but the general control and management of the department has been the subject of much complaint on the part of inventors and patent attorneys for many years. It is possible that the Democrats will find many abuses deserving correction, and it is to be hoped that they will make the necessary reforms; but they will best assist inventors and advance the manufacturing interests of the country by increasing the staff of the Patent Office and giving it a larger building. At present it is disgracefully undermanned and shamefully housed. There are about 550 employés, when the number should be at least 1,000, who could all be paid out of the earnings of the office; and the lack of accommodation may be inferred from the simple fact that the electrical division, with its 6,000 patents and a rapidly growing work, occupies two dismal, small, damp rooms on the ground floor, under which there is no cellar. It is high time that some of the 20,000 cases on hand should be disposed of, and that part of the accumulated $2,000,000 of surplus and of the $200,000 now turned over to the general treasury annually should be devoted to its proper employ. The fact that the whole laboratory of the office is not worth $500, and that the apparatus in the electrical division consists of only ten cells of Bunsen battery, a small hand dynamo and two old galvanometers, is enough to arouse any one to fierce indignation.

PRESIDENT BATES, of the Baltimore & Ohio Telegraph Company, and the Hon. W. H. Armstrong, Commissioner of Railroads, have kept up throughout the week their wordy warfare over the demand of the company for the same telegraphic rights along land grant and subsidized railroads as are at present exclusively enjoyed by the Western Union Company. Little good is to be expected from the controversy in its present shape, for while the telegraph company are firmly insistent that their business shall be handled, when necessary, by the Union Pacific Railroad Company, the Commissioner appears to believe that his duties were discharged "when in response to the Senate resolution the facts were fully and impartially presented," and refers the applicant to the courts for a judicial interpretation of the points involved. Mr. Bates retorts that, evidently, the Commissioner considers his office "neither judicial, administrative, mandatory, nor even corrective," and he asks that the correspondence be communicated in proper form to the Secretary of the Interior. He thus presents the demand of his company "This is not a controversy between rival (telegraph) interests, although for obvious reasons the counsel for the contract between the Union Pacific Railway Company and the Western Union Telegraph Company doubtless desired you to so conclude, thus distracting your attention from the real issue; but it is a controversy between the public, as represented by the Baltimore & Ohio Telegraph Company, and the Union Pacific Railroad Company, in regard to the performance by the latter-named company of its statute obligations, which controversy has been brought to your attention by means of Senator Gorman's resolution of inquiry. We do not seek a contract with the Union Pacific Railroad Company like or similar to the Western Union contract, because that contract virtually estops the Union Pacific Company from doing its own telegraph business, but we ask that the railroad company shall accept from and exchange telegraph business with this company in the same general manner as it accepts from and exchanges railroad traffic, passengers, merchandise, etc., with other railroad companies, and that the telegraph business exchanged with the Baltimore & Ohio Telegraph Company shall not be performed for the Union Pacific Company by the Western Union Telegraph Company, either directly or indirectly, but that the railroad company itself shall fulfill this bounden duty for itself and through its own employés."

Curious Phenomena Observed in Incandescent Lamps.

The first volume of the Transactions of the American Institute of Electrical Engineers has just been published, and contains a number of excellent papers, read at the meeting in Philadelphia during October, 1884.

One of the most interesting of these—interesting on account of the puzzling facts brought to light, was that read by Prof. Edwin J. Houston, who described some very curious phenomena in connection with incandescent lamps. These peculiar high vacuum experiments, which were observed by Mr. Edison, were explained by Prof. Houston as follows:

"I have in my hand an Edison incandescent lamp, having the same vacuum as the ordinary incandescent lamp. This one, however, has, in addition to the carbon filament, a platinum plate or strip, that is thoroughly insulated from the filament, and supported in the manner seen between the two branches of the filament, as shown in Fig. 1.

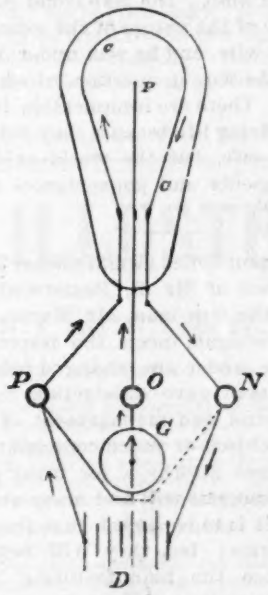


FIG. 1.

"An Edison carbon filament c, c is placed inside an inclosing glass case in the usual manner. A strip of platinum foil P is supported as shown inside the loop. The binding posts *P* and *N* are connected to the ends of the carbon loop, and *O* to one end of the platinum plate. *P* is the positive and *N* the negative terminal of the electric source.

"The lamp being placed in the circuit of any electrical source, as, for example, a battery *D*, the current will flow in the direction indicated by the arrows. The galvanometer *G* has one of its terminals connected with the positive terminal *P* of the electrical source, and the other terminal connected with one end of the platinum strip or plate.

"*P* representing the positive terminal, the current may be conceived as flowing through the filament in this manner. [Indicating.] If the ordinary current used in producing the light is passing, then no unusual effects are noticed. If, however, the current is increased, so that the incandescence of the filament is raised from its normal, say, eight candle-power, to twenty, thirty, forty, fifty or one hundred candle-power, then the needle of the galvanometer is violently deflected by a current passing through its coils.

"The question is, What is the origin of this current? How is it produced? Since we have within the globe a nearly complete vacuum, we cannot conceive the current as flowing across the vacuous space, as this is not in accordance with our preconceived ideas connected with high vacua. I should mention here that if the galvanometer terminal, instead of being connected with positive *P* of the electric source, be connected with the negative *N*, then we also have a current flowing through the galvanometer, but this time in the opposite direction. But in this case its amount is much less, being but about $\frac{1}{40}$ of the amount of the first current."

As regards the origin of the phenomenon, Prof. Houston had no theory to propound.

"It is very clear," he said, "as to the direction in which the current flows, when one end of the galvanometer is connected with the positive terminal *P*. This I have traced by observing the direction of deflection of the galvanometer needle. The current flows, not as we might suppose, from the carbon to the platinum; it flows apparently in this direction, as if it came from the platinum. If it flowed as though it went from the carbon to the platinum, then it might be ascribed to various causes. It may be electricity flowing through empty space, which I don't think probable; or it might be the effect of what may be called electrical convection, if there is such a term. The Crookes discharge from one of the poles might produce an electrical bombardment against the plate, each molecule taking a small charge that might produce the effect of a current.

"If we conceive, as I think most probable, a flow of molecules passing from the platinum to the carbon, then the phenomena may be readily explained as a Crookes effect, since then we can regard a current as flowing in parallel circuit, from *P* to *N*, through the carbon loop, and from *P*, through *G*, *O*, and P, to the carbon loop. But, remembering that the direction of the current is reversed, or apparently so, when the galvanometer is connected with the negative terminal *N*, then the difficulty is to understand how the current there produced could possibly overcome the current from the source supplying the lamp. I should say here, however, that I am not entirely convinced from the few experiments I have tried myself, as to the actual existence of such a current, the deflection of the galvanometer needle, when connection was made with the negative terminal, being quite feeble. I am assured, however, that decided deflections have been observed."

Prof. Houston also drew attention to another lamp in which two platinum plates are inserted, and which was described as follows:

"In this lamp, as shown in Fig. 2, the parts are the same as in Fig. 1, only two platinum strips P P', placed parallel to each other, are employed. If a current is produced when the terminals *O* are connected with the galvanometer, then the phenomena is still more difficult of explanation I believe, however, that one pole of the electrical source is always connected with the galvanometer, the other being connected with either or both of the platinum terminals. If such is the case, then the phenomena are simply modifications of the preceding.

"I believe we shall find the preceding phenomena worth looking into. For my own part I am somewhat inclined to believe that we may possibly have here a new source of electrical excitement, that in some way the molecular bombardments against the platinum plate may produce an electrical current. At least, supposing it to be true that when the terminal *N* is connected with the galvanometer, the current through the galvanometer flows in the opposite direction to the current from the electrical source, it would seem that the phenomena could not be ascribed to the Crookes effect.

"Supposing, however, this opposite current out of the way, then a more careful inquiry may show the sufficiency of the Crookes effect for the explanation of the phenomena. Indeed, an experiment Mr. Edison has made, would appear to throw no little light on the matter. Instead of placing the platinum pole P inside the carbon loop, it was placed in the end of a long tube *T*, *T'*, forming a part of the lamp case, as shown in Fig. 3. When the connections were made, as shown, with the platinum at P, so as to place it in line with the carbon, and, therefore, expose the filament to the bombardment of the molecules shot out from the platinum, the needle of the galvanometer was deflected, even though the tube *T* was surrounded by a freezing mixture. When, however, the platinum was placed at P', in the branch tube *T'*, out of the direct line of the carbon, no effects were observed in the galvanometer."

In the discussion which followed the reading of this paper, Mr. Preece, in commenting on the observed fact that the current in the lamp seemed to flow from the platinum plate to the carbon filament—or from a *lower* to a *higher* potential—remarked as follows:

"I do not think that we have any facts of any sort or kind to justify us in assuming that electricity flows in one direction rather than the other; but I would mention this, that in all recent inquiries that Crookes has made, and also Spottiswoode, before his death, they all had the tendency to show that if electricity does flow at all in any direction, that direction is rather from the lower to the higher potential, than, as we are all accustomed to admit and believe, from the higher potential to the lower potential. In other words, the tendency of the inquiry of Spottiswoode, De la Rue, and Crookes, and one or two German inquirers, whose names at present I forget, all rather tend to confirm the suspicion that electricity flows in the reverse direction to that which we are accustomed to admit."

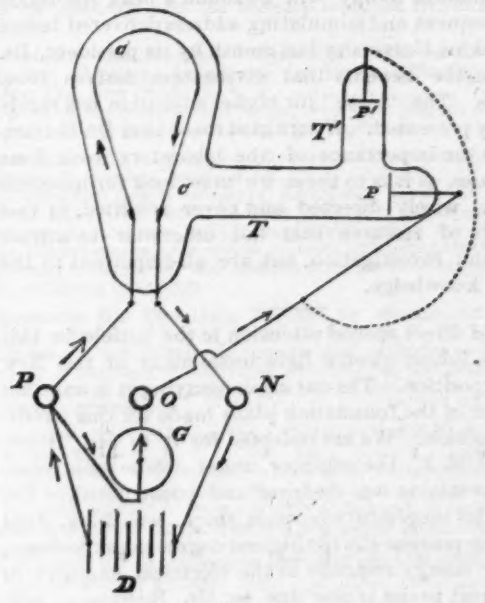


FIG. 3.

Mobile, Ala.—The Mobile Electric Light Company will be ready to furnish lights by April 10. The company have already secured thirty-one subscribers, a number of whom will burn the lights all night. It is expected to double the capacity of the plant and to increase the capital stock from $15,000 to $60,000.

Electric Protection Against Thieves.

In large cities where store-houses, banks, and other buildings contain property aggregating hundreds of millions, it becomes of prime necessity not only to guard them against thieves, but to provide means by which watchmen are kept to their duty and can summon aid when occasion requires. The frequent burglaries reported, in connection with which it transpires that watchmen have been derelict in their duty, or have been overpowered, could have been frustrated had the persons robbed availed themselves of such a system as that in successful operation for some time in this city by the Holmes Electric Protective Company. The territory covered by the company embraces all the principal streets from the Battery to Harlem, divided into four districts, with a like number of central stations. Knowing that the readers of THE ELECTRICAL WORLD are always interested in a description of the methods employed in an extensive system of this kind, we paid a visit last week to the principal office of the company, and under the guidance of Superintendent Frank G. Lyon, examined the different features in detail.

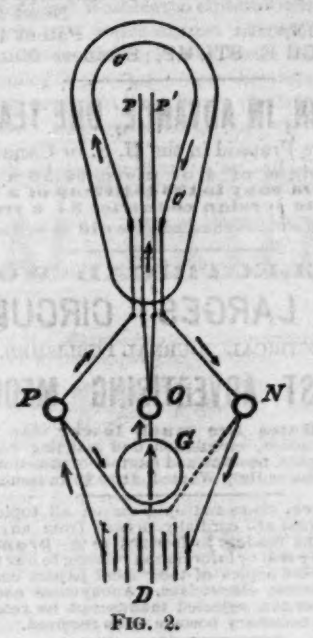


FIG. 2.

The service provided by the company may be said to be threefold, and consists, first, in keeping private watchmen strictly to their duty; secondly, in providing watchmen to make periodical inspections of buildings at short intervals; and thirdly, in applying burglar alarms to premises which are not guarded by a watchman, so that any attempt to enter them would be signaled at the central office.

In describing the system from an electrical standpoint the first two features just mentioned may be classed under one head, in so far as they involve the same principles. In both, the object sought is to insure the presence of a watchman or patrolman at a certain point at a definitely fixed time. In the case of a private watchman guarding premises of considerable extent, call or signal boxes are placed at certain intervals throughout the place, and these are connected by wire to the central office, the earth forming the return circuit.

At the central office there is situated an automatic register with a bell, so that any signal sent can be heard by the attendant in charge, while at the same time a record is made of it on a roll of paper. Some additional electrical arrangements are used in connection with the above, but their use will be described presently.

We will suppose, for the sake of illustration, that a large establishment has six signal boxes situated in various parts of the building. In this case it would be so arranged that the watchman would signal from each successive box once in ten minutes at definite times. As he sends a signal from the box, the attendant at the office marks the exact time of its receipt on the recording paper; and, in addition, enters it upon a sheet specially prepared and which shows the attendant in charge when the signal is due. The watchman is allowed a few minutes' grace; but if after the end of that time no signal arrives, two men are immediately dispatched to the place, who ascertain the cause of the non-receipt of the signal and render assistance if it should be required.

If the number of boxes be less, the signals will be the same in number, but more frequent from the same box, and vice versa, if there be more boxes.

The second feature described above consists of an organized patrol duty in which the men employed by the company examine the doors, windows, etc., of buildings, and pass on to the next, repeating this operation frequently over their entire route. On the outside of every such building there is placed a locked signal box, and as the patrolman arrives at the point he unlocks the box and sends the signal to the central office to indicate his presence. Should he notice anything amiss about the building which he cannot himself rectify, such as an unlocked door, open window, etc., then instead of sending in the ordinary signal, he sends in the police signal in the same manner as is done in the messenger call box, by turning the crank somewhat further than usual. The patrolman makes an entry of the facts in a note-book and then continues on his way. In the mean time the central office

has sent out two men in response to the police signal, and they run towards the patrolman, knowing exactly where he is upon his route. The latter then communicates to them the trouble, and while one stands guard at the building, the other hurries back to the office and notifies the attendant. In case the keys of the premises are required, the person in whose possession they are is notified by telegraph, and not until his arrival is the place left unguarded.

The patrolmen are restricted to definite routes between stations, and are required to be at stated points at definite times. A roundsman is employed, who may happen to be at any of these "time-points," and if the patrolman is not there, a satisfactory explanation is required. It will be seen that the patrolman is never delayed by any existing trouble, but by leaving it to the men sent out, continues on his way to the other posts on his route.

The additional electrical contrivances are used for the purpose of testing the condition of the line and the office arrangements. In order to test the latter an auxiliary signal box is employed, which is placed next to the ground in the central office. By turning the crank of this the recorded signal shows that the instruments and batteries in the central office are in good order.

As there are as high as thirty or forty signal boxes in series on the line, however, it becomes necessary to know at frequent intervals whether the line is intact. Such a test is made every fifteen minutes, and by the following means: At the very end of the line where it enters the ground, a clock is placed which contains a mechanism similar to the call boxes. The ordinary currents sent over the line have no effect upon this instrument; but at intervals of fifteen minutes the attendant at the central office, by pressing a button, throws on a strong current momentarily.

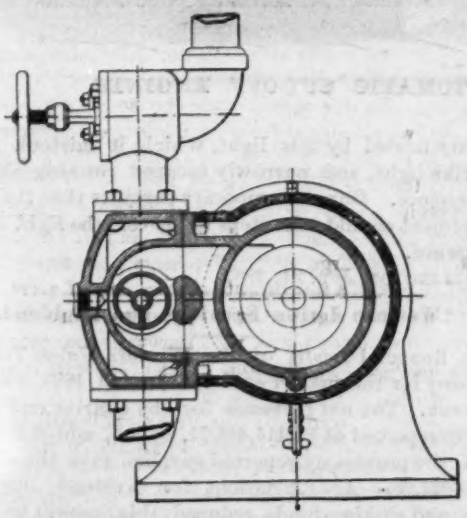


FIG. 2.

This has the effect of tripping the clock movement, and it transmits its number over the wire in the usual manner.

If the line be broken at any point this signal will not be received, and then recourse is had to a very simple means of determining the exact point of the break. Such a break, however, does not necessarily interfere with the entire number of boxes on the circuit, but merely disables those which are situated beyond, those *between* the break and the central office being still operative.

In order to explain this we must state that the circuit is normally closed, and that the signals are sent by means of a toothed wheel revolving under a spring finger, by which breaks in the current are effected. In addition to this toothed wheel, each signal box has a second wheel mounted on the same shaft as the other, but cut in a reverse way, so as to leave *spaces* where teeth occur on the first, and vice versa. This second wheel is connected to the ground, and under the normal condition of the line has no effect upon the transmission of signals. When a break occurs, however, the working of the line is changed from a closed to an open circuit. To effect this, the ground switch at the central office is reversed, and now any signal sent in will be recorded by the temporary *closing* of the circuit effected by the toothed secondary wheel. As stated before, the boxes beyond the break become disabled, but by merely trying each one, the point of fracture can be easily determined.

The electrical arrangements used in the burglar alarm system differ according to whether the premises are closed for a short or long period of time. The first includes all business premises, and they are fitted up as follows: Two wires are run continuously to every door and window to be protected, and at the end of the two wires the circuit between them is closed by interposing a high resistance coil. The other ends of the wires are, as usual, connected respectively to the line and ground. The central office contains a delicate upright galvanometer in circuit with the line, and it is deflected a certain distance by the constant current passing over the line and through the resistance. Two stops on the galvanometer are so arranged that the slightest deviation of the needle either one way or the other closes a local circuit, drops an annunciator and sounds an alarm. Returning again to the building, we find the doors and windows provided with a stop and spring finger each, connected respectively to the two passing wires. When the door is closed, the spring is out of contact with the stop; but the slightest movement towards opening it, necessarily brings them together and forms a cross connection between the two wires. This, of course, forms a shunt to the high resistance and an instantaneous increase of current deflects the galvanometer needle at the central office and sounds the alarm, whereupon steps are immediately taken to ascertain the cause.

Again, the rupture of the wires in the building at any point would break the current completely, and by allowing the needle to fall back would sound the alarm as usual.

Buildings are frequently protected in this way by covering the walls with paper upon which strips of tin foil have been cemented and which take the place of wires. They, again, are covered with the usual wall paper, and their presence is thus completely concealed. Any attempt to break through such a wall would necessarily rupture the tin foil strips and sound the alarm.

Private dwellings which are left unoccupied for a number of months are protected somewhat differently as regards the electrical arrangements. In this case every conceivable point of entrance to the house is protected by a very fine wire, which is run continuously from one point to the other, with frequent breaks, which are united by a loose twist. In this fine wire circuit there is included a battery of two or three cells and a relay. The back contact of the latter closes a local battery of two Leclanché cells, the circuit of which passes through a call box. The latter contains a clock-work and electromagnet, which latter, when energized, trips the movement, and the signal is sent.

It will be seen, therefore, that as long as the fine wire circuit is complete, the conditions remain unchanged. As soon as a break occurs the relay acts, and by closing the local circuit gives the alarm.

The fine wire may be so distributed that the mere turn of a door-knob or the opening of a shutter slat may give the alarm. And so quickly can the arrangement be installed that only two and one-half hours before the house is locked up suffices to completely cover it with an impenetrable network.

The charges made by the company for the different services vary, of course. For the ordinary patrol system $1.50 per month is charged. For the private watchman, as described above, $5 per month is charged for the first box, $2.50 for the second and $1.00 for each succeeding one, so that any additional number above two would entail very little expense. Finally the burglar alarm for private dwellings costs $20 for installation and $5 per month for any term not less than three months.

The reasonableness of the terms and efficiency of the service have caused the system in New York to spread out considerably, and the main office on Broadway alone has 400 galvanometers in circuit. The force regularly employed numbers 200 men, including a reserve force, who are ready to respond at a moment's notice to calls upon them.

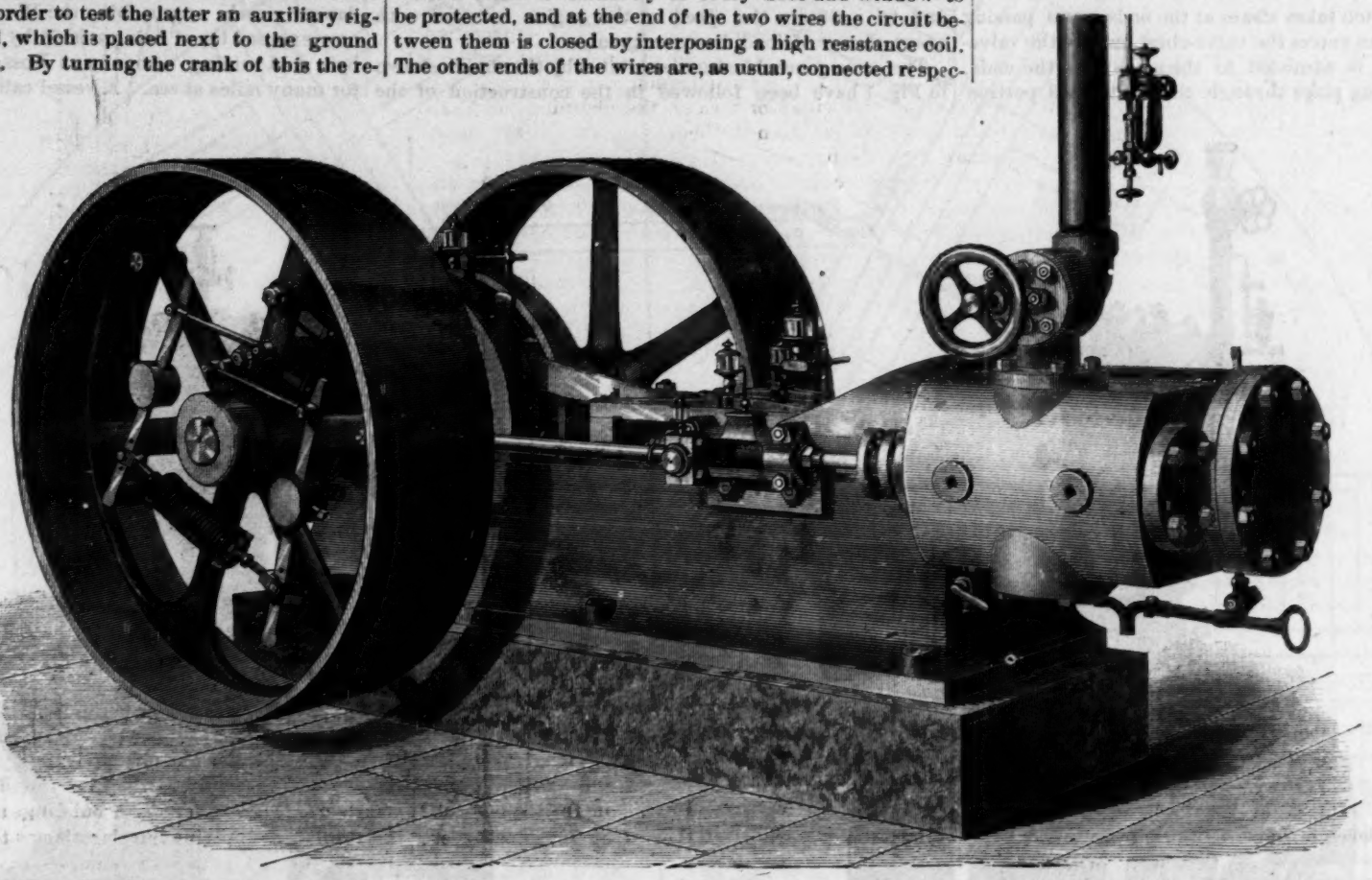


FIG. 1.—NEW YORK SAFETY STEAM POWER COMPANY'S HORIZONTAL AUTOMATIC CUT-OFF ENGINE.

The New York Safety Steam Power Company's Engine.

The electric light had barely been firmly established when it became apparent that its commercial success depended in a great measure upon the prime mover, the steam-engine. As soon as this fact was recognized, engine builders set about the task of devising means to build

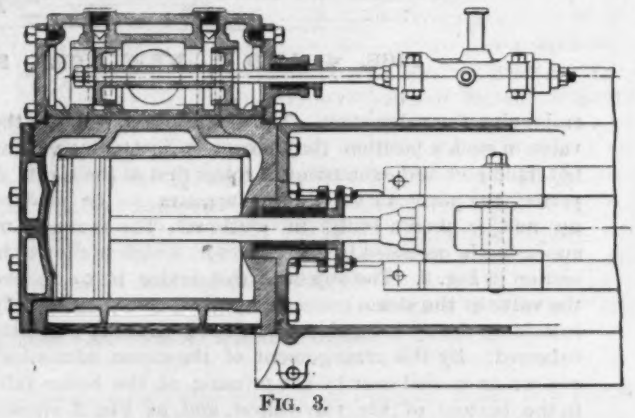


FIG. 3.

their engines in conformity with the requirements of the case; and the result has been that, where but three or four years ago suitable electric light engines were few in number, we can to-day choose from a considerable variety. We cannot here enter upon the discussion of what constitutes a good engine for the purpose under consideration; but we may remark briefly that the desideratum is an engine which shall first maintain a constant speed under any change of load within its limit of capacity; secondly, one in which the consumption of steam shall be in exact proportion to the load; and thirdly, the parts of the engine should be so designed that they will perform their functions with the greatest efficiency, while those subject to wear should be provided with means for reducing the latter to a minimum.

With this general outline as an index, we bring before

our readers an engine in which these points have constantly been kept in mind, and which is the result of mature consideration bestowed upon all its details.

The perspective view, Fig. 1, shows the horizontal automatic cut-off engine of the New York Safety Steam Power Company. It is a high-speed engine, in which every part is reduced to the simplest form permissible with good economy, and it presents a number of points peculiar to itself. As will be seen, the frame is cast in one piece, the bottom of the bed being planed to a true surface, and the cylinder bolted at the end.

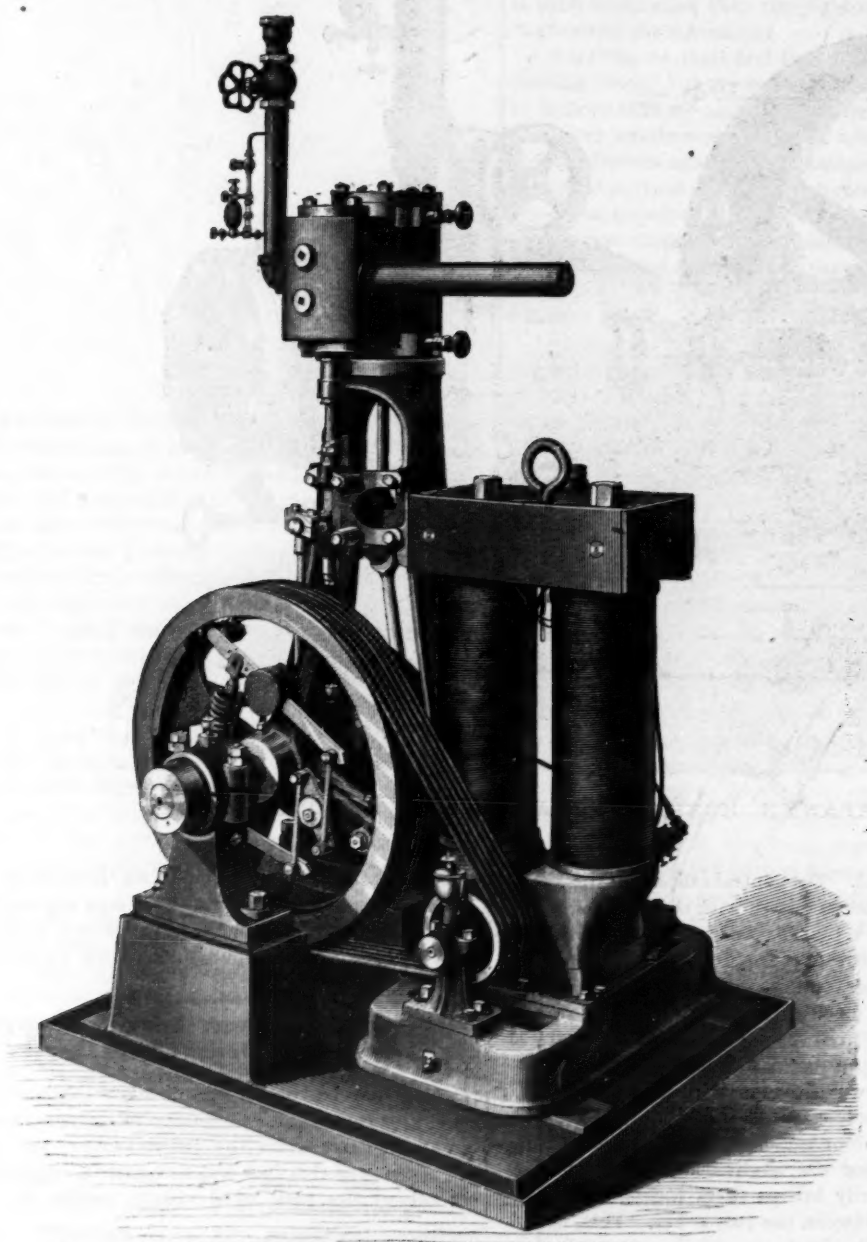
The construction of the cylinder, steam-chest and valve is shown in Figs. 2 and 3, representing, respectively, vertical and horizontal sections through these parts. A glance at the illustrations shows that the valve-chest is detachable, being bolted to the side of the cylinder; no packing is used at the joint, however, since the surfaces are scraped perfectly true, thus constituting a metallic joint. The distribution of steam is effected by the Davis balanced piston-valve, which takes steam at the ends, none passing through it. Steam enters the valve-chest outside the valve-case proper, and is admitted to the ports from the ends, the exhaust taking place through the contracted portion embracing the valve-stem. The diagram Fig. 3 shows the valve in such a position that steam is just entering the left-hand port and exhausting through that at the right. A part of the ports, in the figure, appears to be blocked up and is shown only in outline. The space thus appearing is occupied by the deflector, which is shown in section in Fig. 2. The object of this device is to relieve the valve of the steam pressure which it would ordinarily sustain on the cylinder side, and thus to make it perfectly balanced. By this arrangement of the steam admission, any water carried over by the priming of the boiler falls to the bottom of the valve-chest, and, as Fig. 2 shows, must rise to the height of the lower edge of the valve before it can enter the cylinder. Before this occurs, however, it can be trapped out or occasionally blown off, thus keeping the cylinder entirely free from water. The valve-chest is provided with two screw-plugs in its side, which can be removed to permit inspection of the condition and working of the valve.

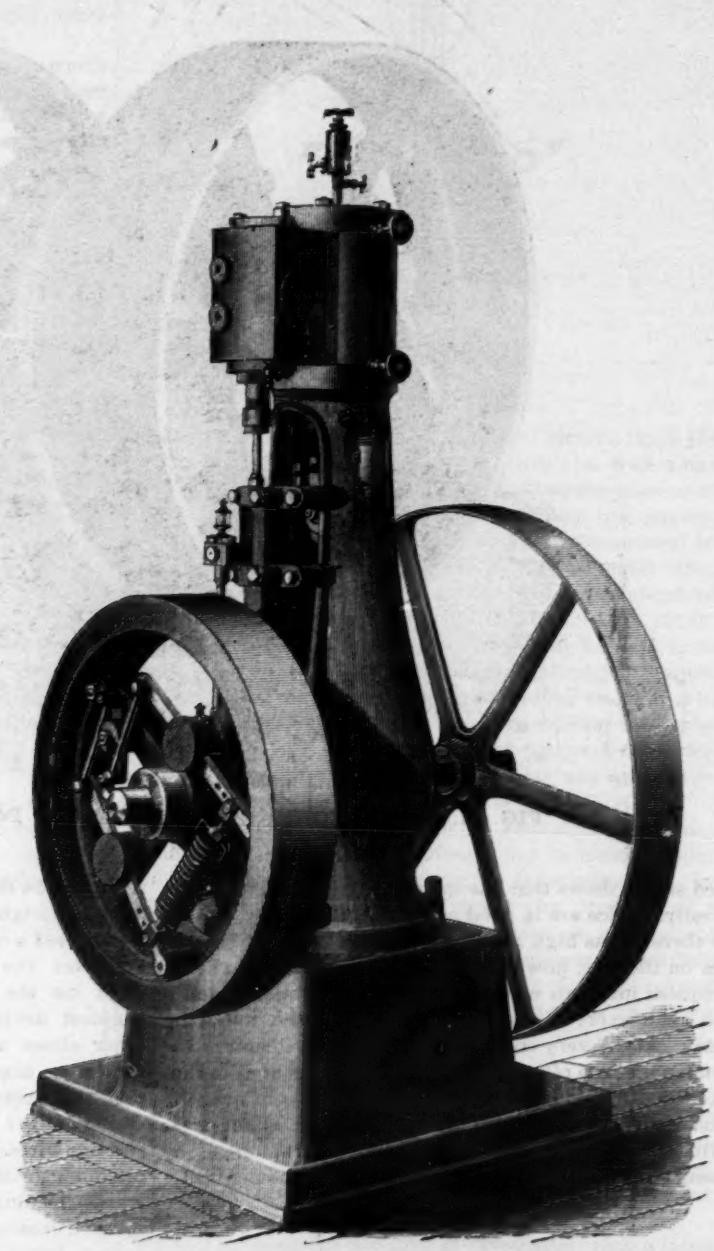
The governor of this engine attracts attention on account of its novel form, which differs entirely from any other. In the majority of automatic engines, governors have been made to act directly upon the eccentric and to move the same so as to change the position of the centre of the eccentric in its relation to the axis of the shaft. In some of these cases, however, difficulty has arisen in holding the eccentric with sufficient rigidity to prevent the eccentric itself from being displaced, owing to the friction of the valve upon its seat. In the present instance, this trouble is avoided by the use of a secondary eccentric. By referring to Figs. 1 and 4 it will be seen that the main eccentric has a slotted arm which projects radially, and one of the spokes of the governor wheel is bored to receive a pin which passes through it. The front end of the pin, as is clearly shown, carries two arms, which are connected by links to the levers supporting the governor balls. The other end of the pin is a small eccentric which fits into a block which has vertical play between guides affixed to the arm of the main eccentric. Thus, when the governor balls change their position, the levers turn the pin and small eccentric, and the latter, acting in the arm, changes the throw of the main eccentric and consequently the travel of the valve. The small eccentric, having a strong leverage, keeps the main eccentric in position to resist any tendency to shift from the cause above mentioned, and maintains it rigidly in its correct position in conformity with the load on the engine. This ingenious device has been found to work very well and to maintain the speed of the engine constant with every change of load, however great.

The same general features exhibited by the engine shown in Fig. 1 have been followed in the construction of the vertical engine illustrated in Fig. 4, which has been specially designed to occupy as small a space as possible in connection with the dynamo. As will be seen, the two are placed close together, and connection between them is made by coiled wire belting lying in grooved pulleys. Six of the wire-belts are used, and as they are perfectly flexible in every direction, they can be strained far beyond the point which would limit a leather belt. Thus, slipping, even under the heaviest work, is avoided. Another advantage of this form of gearing is that should one of the belts break at a joint it would not necessarily interfere with the work, as the others would be amply sufficient to perform the duty until the broken one could be repaired.

Where space is necessarily restricted, especially on board ship, this combination of engine and dynamo presents all the advantages of direct connection, but, nevertheless, leaves the parts separable, and thus easy of transportation and removal, if necessary. Fig. 5 is another view of the vertical engine.

Both styles of engines are finished throughout in the best manner, the cross head and crank-pin boxes being of brass and of ample proportions. The piston is fitted with the Dunbar packing. Piston and valve rods are of steel and of large diameter. All parts of the engine are made interchangeable. Automatic lubrication of the principal parts is performed in an efficient manner by an excellent system of stationary sight-feed oil-cups and traveling wipers. This engine has been introduced with success into a large number of lighting stations and factories, and into the government service. It has taken rank as one of the best engines in the market for electric lighting, because of the superior excellence of its design and construction, its perfection of regulation and evident durability. The company manufacture a variety of sizes and carry a large stock, hence can meet almost any requirement promptly.





FIGS. 4 AND 5.—NEW YORK SAFETY STEAM POWER COMPANY'S VERTICAL AUTOMATIC CUT-OFF ENGINES.

New Zealand Notes.

Owing to the very few increases to salary given during the past year, operators are on the lookout for more lucrative prospects than the telegraph department offers.

The wire accommodation between Auckland and Wellington is proving insufficient for the increasing traffic. The present line of poles is a coastal one and subject to heavy leakage. A new line is projected to run on an inland route and thus avoid weather contact, etc.

In regard to the electric light at Ross, the Lyttelton *Times* calls the attention of the marine authorities to the danger vessels approaching the West Coast at night are now exposed to, of being misled by the electric light used by a gold mining company at Ross, and which is visible for many miles at sea. A vessel called the "Zephyr" was recently misled by this light, which it mistook for the Hokitika light, and narrowly escaped running ashore in consequence. Our contemporary suggests that the Marine Department should take steps to prevent the light showing to seaward.

WELLINGTON, Jan. 31, 1885.

Western Union Earnings and Dividend.

The financial report of the Western Union Telegraph Company for the quarter ending March 31, 1885, was issued last week. The net revenues for the quarter ending Dec. 31 were reported at $1,415,846.71, which, added to $4,159,190.57, the previously reported surplus, gave the company $5,575,037.28. Appropriations for dividend, interest on bonds, and sinking funds reduced this amount to $4,231,667.06, which was the surplus reported to be on hand Jan. 1, 1885. The statement for the present quarter is as follows:

Net revenue based upon nearly completed returns for January, partial returns for February, and estimating the business for March		$1,350,000.00
Add surplus Jan. 1		4,231,667.06
Total		$5,581,667.06
Interest on bonded debt	$123,500	
Sinking funds	20,000	
		143,500.00
Balance		$5,438,167.06
Dividend of 1¼ per cent. on the capital stock		1,199,835.00
Deducting which leaves a surplus, after paying dividend, of		$4,238,332.06

For the purpose of the dividend just declared the transfer books of the company will be closed March 20.

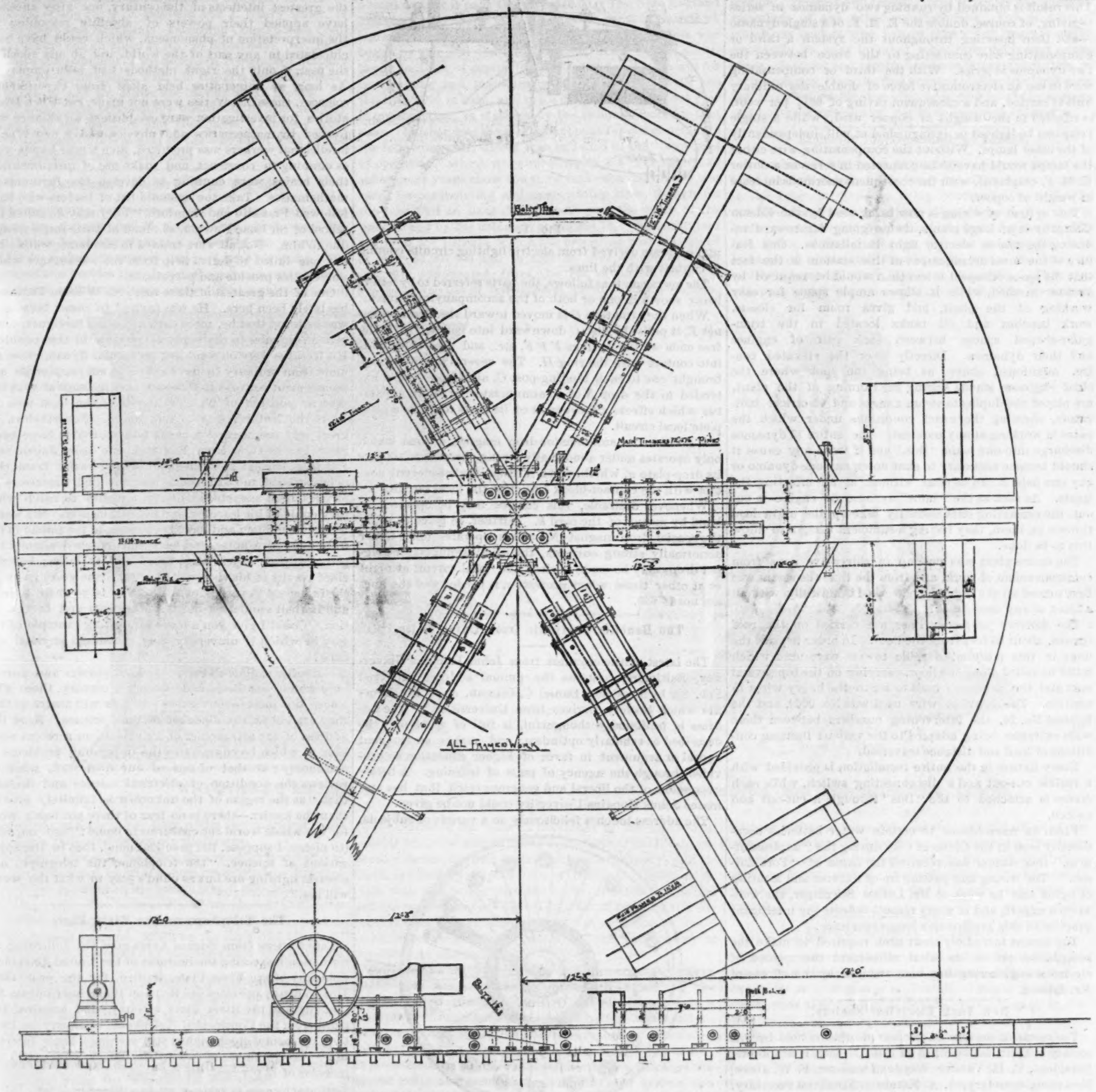
Incandescent Electric Lighting at the Exposition.

BY HENRY M. BYLLESBY, M. E.

Any one who thinks that electric lighting is still in an undeveloped state and lacking in practical perfection of mechanical and electrical detail, would have all such views very effectually dispelled were he to examine the immense plant of the Edison Company at the New Orleans Fair. The completeness of detail manifest in this great plant is common to all the work of the Edison Company, but is particularly noticeable here because of the many conditions existing in such a location which are not met with in a smaller plant or in a different place. The shortness of time allowed for the installation, the exceedingly difficult nature of the wiring, the moist and penetrating atmosphere, and the swampy condition of the soil (water can be found anywhere in New Orleans two feet below surface of ground), all combined to render difficult in the extreme the labor of the constructing engineers of the Edison Company at New Orleans. This is the largest "Isolated" electric light plant in the world, and the only plant of any description which exceeds it in size is the illuminating station of the Edison Company in New York City. The capacity of this New Orleans plant is upwards of 6,000 lamps.

The steam is supplied direct from the large battery of boilers located immediately outside of Machinery Hall. This battery is one of the largest in America, having a capacity of 5,000 horse-power. The motive power is obtained from six Armington & Sims engines with 14½ by 13-inch cylinders, at 250 revolutions per minute, the steam being delivered to their throttles at 80 pounds per square inch. The current is generated by twelve of Edison's "H" dynamos, belted directly to the fly-wheels of the engines, each engine driving two dynamos. The dynamos make 1,050 revolutions per minute, and each works under an electromotive force of 110 volts. The pulleys on the engines are 66 inches in diameter, and those on the armatures 11 inches in diameter.

The lamps supplied by this plant are used for illuminating the Music Hall, Art Gallery, all offices in Main Building, Grand Rapids furniture pavilion, and a portion of Machinery Hall. The lighting in Art Gallery comprises over 1,000 lamps, which are carried nearly half a mile from the generating station—this alone is one of the largest pieces of artificial lighting of the kind ever seen. On this page we give an exact reproduction of the foundation plans for this beautiful piece of work.



FOUNDATION PLAN OF INCANDESCENT ELECTRIC LIGHT INSTALLATION AT THE EXPOSITION.

Owing to the uncertain and marshy soil all around the Exhibition buildings the proper placing of the foundations for this machinery became a matter of much importance, the problem being rendered more difficult by the short time allowed in which to complete the installation. After careful consideration it was decided to build the foundation entirely of timber work, as shown in the illustration (as owing to the shaky condition of the soil it was feared brick foundations would never stand the irritating strains of rapidly moving machinery). An examination of the plan shows that the floor of Machinery Hall rests on joists 4 inches by 6 inches, which joists rest directly on the ground, the floor being built of 2-inch plank spiked to the joists. The heavy timbers forming the foundation were framed and bolted together and then laid directly on this floor. These timbers, it will be noticed, are so framed as to render impossible the sinking of any portion of the network without carrying the entire web; and as this entire web rests on a circular disc, 60 feet in diameter, it actually forms an immense washer, floating, so to speak, on the mucky soil beneath. The manner in which the engines were placed relatively to each other precluded the possibility of any general vibration of the entire structure, and as before mentioned, the timbers were so framed that any movement of one portion relative to another was checked. The space covered by this circular foundation is about 2,700 square feet, and the total weight supported about 300,000 pounds, including steam-pipe and details. The timbers are all Southern yellow pine. The distance between each opposite pair of cylinder heads is 7 feet 6 inches; the distance from centre of engine shafts to centre of armature shafts is 14 feet 6 inches, leaving a clear space between sides of dynamos and outside rail surrounding space of about two feet, thus allowing an easy passage around from one dynamo to the other. The steam is distributed to the six engines from two lines of 8-inch pipe, and the exhaust is carried off by two lines of 10-inch pipe. In event of any accident to either line, the other pipe would be able to carry the plant through until repairs could be made. The centre of space—between the six engine cylinders—is raised 12 inches above the general floor and here the chief engineer of the plant, Mr. C. M. Hennis stands, having a full view of every detail, and in reach of every throttle valve and of the regulating wheels of the resistance boxes, thus having from this spot a complete control over the running of both engines and dynamos. The wires from the dynamos are car

ried to an elevated gallery overhead, where the duplicate "Buses" are situated—this arrangement clears the moving machinery from all contact with or interference from the conducting wires. From the "Bus" the various feeder lines are carried to different portions of the buildings to perform their illuminating function. This is one of the now famous three-wire plants of which such very good things are said by all who are acquainted with the system. The practical and important result of the use of the three-wire plan is a saving of 62½ per cent. of the copper which would be required for a plant on the old two-wire system, while it still allows the lighting or extinguishment of any one or any number of lamps at pleasure, without in any way affecting the brilliancy or life of the remaining lamps of the system. This result is obtained by running two dynamos in series—giving, of course, double the E. M. F. of a single dynamo—and then inserting throughout the system a third or compensating wire connecting to the brace between the two dynamos in series. With the third or compensating wire in use an electromotive force of double the ordinary unit is carried, and a consequent saving of 62½ per cent. is effected in the weight of copper used, while a single lamp can be lighted or extinguished at will, independently of the other lamps. Without the compensating wire either the lamps would have to be connected in series or a lower E. M. F. employed, with the consequent enormous increase in weight of copper.

This system of wiring is now being used by the Edison Company in all large plants, its use going far toward reducing the cost of electric light installations. One feature of the novel arrangement of this station is the fact that the space occupied is less than would be required by another method, while it allows ample space for easy working of the plant, and gives room for closets, work benches and oil tanks located in the triangular-shaped spaces between each pair of engines and their dynamos. Directly over the elevated centre, mentioned above as being the spot where the chief engineer stands during the running of the plant, are placed the duplicate steam gauges and electrical indicators, showing the exact conditions under which the plant is working at any moment. The entire 12 dynamos discharge into one main "Bus," and if from any cause it should become necessary to shut down any one dynamo or any one pair, it can be done without at all affecting the lights. As soon as the "lame" dynamo or engine is cut out, the remaining ones instantly take up the extra load thrown on them, they having a sufficient margin to allow this to be done.

The entire plant was put up in thirty-five days from commencement of work, and from the time the steam was first turned on the lights have worked beautifully, without a hitch of any description.

The delivery or feeder lines are carried on the roof trusses, about 65 feet from the floor. In order to place the lines in this position, movable towers were used which could be rolled along the floor, carrying on the top several men and the necessary tools to secure the heavy wires in position. The heaviest wire used was No. 0000, and the lightest No. 24, the intervening numbers between these wide extremes being adapted to the various limiting conditions of load and distance traversed.

Every fixture in the entire installation is provided with a fusible cut-out and a disconnecting switch, while each feeder is attached to the "Bus" through a cut-out and switch.

From its resemblance to certain water batteries occasionally seen in the Crescent City during the "unpleasantness," this station has received the name of "Fort Edison." The wiring and putting up of fixtures and locating of lights was the work of Mr. Luther Stieringer, the well-known expert, and in every respect reflects the intelligent practice of this gentleman's long experience.

The almost incredibly short time required to make the installation proves to what refinement the science of electrical engineering has been reduced by the efforts of Mr. Edison.

New York Electrical Society.

The result of the annual election of officers held by this society at their last meeting on the 11th inst. is as follows: President, P. H. Vander Weyde; Treasurer, F. W. Jones; Recording Secretary, A. A. Knudson; Financial Secretary, E. L. Bradley, all of whom were re-elected, no other nominees being placed in the field.

There were some changes made in the list of vice-presidents and also in the executive committee. The following is the result: Re-elected 1st Vice-President, Geo. B. Scott; 2nd Vice-President, Geo. A. Hamilton; 3d Vice-President, T. A. Edison; re-elected 4th Vice-President, W. J. Johnston; 5th Vice-President, C. O. Mailloux; re-elected 6th Vice-President, Geo. Worthington. New members of Executive Committee: J. A. Seely, H. A. Sinclair, Eugene Lynch, Jr., John M. Pendleton.

An invitation was received from the secretary of the Phelps Induction Telegraph Company inviting the society to visit and inspect the new system of telegraphing on moving trains at such time as was agreeable on one of the trains of the N. Y. & N. H. R. R. (Harlem Branch), passes to and from New Rochelle being furnished the society. The invitation was accepted, and Wednesday, March 25 (the afternoon of the next meeting) named as the day. A vote of thanks was tendered President Vander Weyde for his interesting lecture on "Electric Induction," also a vote of thanks to A. A. Knudson for his donation to the library of ten volumes of Chambers' Encyclopædia.

An Automatic Cut-Out.

Mr. John B. May, of Watertown, Wis., a photographer by profession and an amateur electrician, has had a patent lately granted to him for a new device which provides an automatic grounding apparatus for any desirable number of electrical wires entering a telegraph station, telephone exchange, or other place which may need protection against lightning discharges from the lines, or from abnormal currents derived from electric lighting circuits coming in contact with the lines.

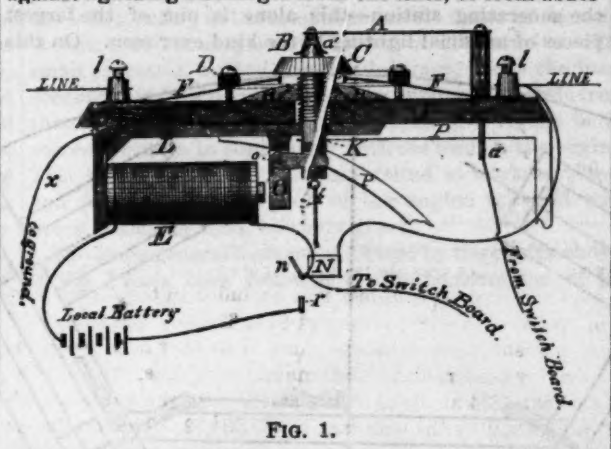


FIG. 1.

The operation is as follows, the parts referred to by letters being shown in one or both of the accompanying figures:

When the armature *O* is moved toward the electro-magnet *E*, it pulls the disc *C* downward into contact with the free ends of the springs *F F F*, etc., and also these ends into contact with the ring *H*. The several line-wires are brought one to each binding-post *C*, and from there extended to the drop *N* of an annunciator, or of an apparatus which effects a movement of its parts to make a complete local circuit.

N is either an annunciator-drop magnet or one which only operates under abnormally strong currents to set free its drop-plate *n*, which, when it drops, makes electric contact with the contact-block *r* to close the local circuit.

Whenever desirable, this cut-out may be operated by hand by means of the cord *k*. Further, in place of using the special drop magnet *N*, which operates only under abnormally strong currents, the usual annunciator magnet drops may be made to close the local circuit at night or at other times when protection is needed and the lines are not in use.

The Benefits Derivable from Universities.

The latest of the circulars from Johns Hopkins University, Baltimore, contains the annual address, delivered Feb. 23, by President Daniel C. Gilman, on "The Benefits which Society Derives from Universities." The address is profoundly thoughtful, is full of what may be described as scholarly optimism, and makes an eloquent appeal or argument in favor of higher education as provided through the agency of seats of learning. A better expression of the liberal and generous spirit that has animated Johns Hopkins University could not be given.

The address touches felicitously on a variety of subjects,

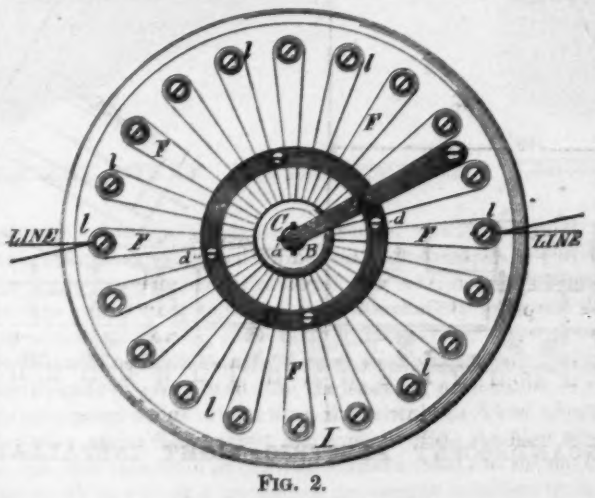


FIG. 2.

but we can find space only for the following, in relation chiefly to electrical study and pursuits:

Many who hesitate to assent to these views of the relation of pure mathematics to civilization, have no question whatever in lauding applied mathematics, especially astronomy and physics; and no wonder, for within the memory of this generation, the world has gained these five results of physical science—steam locomotion, telegraphy, telephony, photography and electric lighting. The first three, it may be said, have revolutionized the methods of human intercourse; the fourth has multiplied infinitely the means of communicating knowledge to the brain by what Sir William Thomson, following John Bunyan, has termed the Eye-gate; and the fifth, still in its dawn, includes possibilities of illumination which we are not likely to exaggerate. But I have no time to eulogize these recent gains of civilization; every word I can spare must be given to emphasize the fact which is most likely to be forgotten, that these wonderful inventions are the direct fruit of university studies. I do not undervalue the work of practical men when I say that the most brilliant inventor who ever lived has been dependent upon an unseen company of scholars, the discoverers and the formulators of laws which he has been able to apply to methods and instruments. Nor do I forget that Faraday, like Shakespeare, was not a university man. But I mean to say that the manifold applications of science, about which everybody is talking, are only possible because of the abstract studies which universities promote. The electro-magnetic inventions which are now so multiform are only possible because scores of the greatest intellects of the century, one after another, have applied their powers of absolute reasoning to the interpretation of phenomena, which could have been elucidated in any part of the world, and at any epoch of the past, if only the right methods had been employed. As long as universities held aloof from experimental sciences, these discoveries were not made, but when laboratories for investigation were established, an alliance was formed by mathematics and physics, and a new type of intellectual workers was produced, men whose hands were as cunning to construct and make use of instruments as their brains were cunning to develop the formulas of mathematics. Take the splendid list of leaders who have followed Franklin and Rumford. They may be called the school of Sir Isaac Newton, so much of their inspiration is due to him. Not all were trained in academic walls; but not one failed to derive help from the advantages which universities provide and perpetuate.

One of the greatest of these men, Sir William Thomson, has lately been here. He was invited to come because it was believed that he, more than any other foreigner, could give an impulse to the study of physics in this country. His lectures were on a subject (molecular dynamics) so remote from ordinary thought that I do not suppose its announcement conveys to those who are unfamiliar with the present position of physical inquiries the least idea of what the lecturer was to talk about. Nevertheless, so great was the attraction of his powers that a large company, two or three from England, one from Japan, several from beyond the Alleghanies, and many from this neighborhood, most of them teachers and professors of physics, here assembled daily for a month to catch what they could of his learning and his enthusiasm. His words were taken down and have been given to the public in the form of lecture notes, and have thus reached already the principal seats of learning abroad and at home; but the chief results of his visit will be seen as the years go on in the increased devotion of his followers to their science and in their emulation of his enthusiasm and concentration. Could I give you a more interesting example of the way in which a university may encourage physical science?

Notwithstanding all the progress in physics and astronomy which has been made during a century, those who know the most about these subjects will assure us that they are but at the alphabet of their science. Read the address of the astronomer of Princeton, on a recent occasion, in which he enumerates the impending problems of astronomy; or that of one of our own staff, when he reviews the condition of electrical science and declares that "as the region of the unknown is infinitely greater than the known—there is no fear of there not being work for the whole world for centuries to come;" and he adds (to please, I suppose, the practical men), that in the applications of science, "the telephone, the telegraph, and electric lighting are but as child's play to what the world will see."

The Telephone on the River Plate.

Late advices from Buenos Ayres give the following information respecting the business of the United Telephone Company of the River Plate, limited, for the year 1884. This company operates the Bell and Blake instruments in that city and the River Plate country, and acquired the plant from the Continental Telephone Company in 1882, the Continental stockholders still owning a large interest in it. Total number of subscribers Jan. 1, 1885, 1,355, an increase of 13 per cent. for the year.

Estimated increase in value of plant, after writing off liberal amount for depreciation, £3,500, say		$17,500
Debts of company were reduced, £7,000, say		35,000
Receipts from subscribers last nine months of 1884		$59,775
Receipts from pay messengers last nine months of 1884		1,905
Receipts from sales of instruments and supplies last nine months of 1884		66,285
Total receipts for nine months		$127,965
Estimated at same rate for January, February and March, 1885		42,655
Receipts for the year ending March 31, 1885		170,620
Cash statement, 1885:		
Cash on hand and in bank	$10,100	
Notes and bills receivable	12,300	
		$22,400
Debts due in Buenos Ayres and Europe	$4,971	
Debts due Continental Tel. Co	30,000	
Debts due Tropical Co. Syndicate	12,831	
		$47,802
B. A.—About 4 per cent. discount.		$25,402

The estimated expenses were $74,591. The capital is £200,000, and the value of the plant $250,000. The Continental Company of Boston expended over $100,000 there,

Receivers' Certificates.

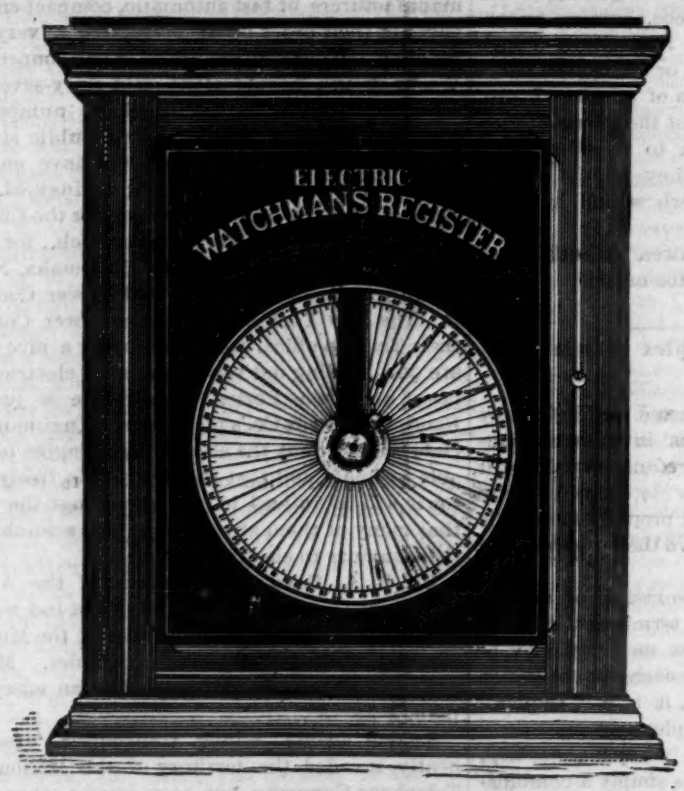
At a recent meeting of the bond and stock holders of the Bankers and Merchants' Telegraph Company the fact was elicited that Edward S. Stokes, of the Hoffman House, had advanced $419,000 on receivers' certificates. Persons who believe that close personal and business relations exist between Mr. Stokes and John W. Mackay at once jumped to the conclusion that Mr. Stokes was acting for Mr. Mackay, and that the last-named gentleman was seeking to get control of the Bankers and Merchants' line in order that he might unite it with the Postal Telegraph, in which he is credited with having invested a large sum of money.

Another explanation of Mr. Stokes' advances to the receivers of the Bankers and Merchants' Company is that he has been acting for A. J. Baldwin and J. Henry Miller, of the Bankers and Merchants' Telegraph Construction Company, which has an office at No. 78 Broadway. Mr. Baldwin was the president of the Southern Telegraph Company prior to its consolidation with the Bankers and Merchants', and both he and Mr. Miller are friends of Mr. Stokes.

The foreclosure proceedings instituted by the security holders of the Bankers and Merchants' Company have been postponed until a copy of the statement filed by the former receivers can be procured.

Watchman's Electric Time Register.

Our engraving represents a form of time register designed for the purpose of acting as a check upon the watchman by giving a printed record of the manner in which he makes his rounds and performs his duty. The case contains besides the electrical arrangements a clock-movement which revolves a paper dial at a uniform speed,



WATCHMAN'S REGISTER.

bringing the various radial lines under the marking point at the time indicated on the circumference.

The case is placed in the office or any other desired location, and connected by wire to buttons located in different parts of the building at the points which it is desirable to have him visit. The buttons are all numbered, and as the watchman passes them on his rounds of duty, he presses lightly on each one, and prints on the clock dial the number of the button pressed and also the exact time at which he passed it.

It is impossible to tamper with the instrument without detection, as the record can only be made by pressing the button, any attempt to open the clock being registered on the dial.

The register, which is made by the Redding Electrical Company, of Boston, Mass., is in use in a number of places, among them being the Washington Monument.

The Bell Company's Petition.

The Legislative committee on mercantile affairs resumed its hearing on March 12, at Boston, on the petition of the Bell Telephone Company for increase of capital. Hon. Charles S. Lilley, of Lowell, in behalf of the remonstrants, argued against allowing the company to increase its capital to $30,000,000. He said the fact that remonstrances came from all parts of the State showed a widespread opposition to the increase. In reviewing the history of the company he said the Bell, organized with a capital of about $800,000, of which $10,000 was paid in cash, had, at the end of its first year, assets amounting to over $1,600,000, an increase of 100 per cent. Then an increase of $15,000,000 was asked for, chiefly on the ground of the large expense of maintaining the lines of wire. The committee reported a bill granting an increase to $10,000,000, in just 24 hours after the hearing, thereby creating the most gigantic, merciless and profitable monopoly this State or the nation ever saw. On the very day that the company was asking for an increase of capital to $15,000,000, on the plea that the money was needed to maintain wires, the stock was selling at $795 a share, showing that the real motive of the company was a desire to cover up from the public the immense profits of the speculation in which only $10,000 was originally invested, as appears by the sworn statement of its officers. The increase was also urged on the ground that a large tax would be collected by the State in consequence of it. The result has been that the corporation now holding $19,000,000 of stock in other companies, on which $440,000 worth of dividends were paid last year, while its own stock is worth $15,000.000, has paid just $24,000 in taxes, and last year got its Boston valuation abated so that it paid the city $43.50. The New England Telephone Company paid a tax of 62 cents in New York and no tax elsewhere. As a matter of fact, business was begun by the Bell Company in 1880, under the act allowing an increase of capital to $10,000,000, to allow means for constructing and maintaining telephone wires, with less than $500,000 in cash, and not a dollar was spent that year in construction, as is shown by the annual report for that year. Neither was there a dollar spent for construction in the following year, unless it is included in the "expenses of operation," which were but $116,622.27. The reports of subsequent years show the same fact—that no money was spent for constructing and maintaining lines, though for the year 1884 an item in the assets puts the value of the lines owned by the company at $49,004.72. The same year the item for patents, which the preceding year was given at over $3,000,000 and in 1882 at over $6,000,000, had entirely disappeared from the list of assets, and appeared in the list of liabilities at about the same figures.

In the course of Mr. Lilley's reference to the transfer of patents from the side of assets to the side of liabilities, ex-Senator Bruce, counsel for the telephone company, said he had a satisfactory explanation of that. Mr. William B. Gale, who was acting with Mr. Lilley, asserted that he had put the problem before a great number of bankers and accountants in Boston, and they could not see how it could be explained in a manner consistent with the honesty of the different statements.

This peculiar method of book-keeping should be thoroughly investigated by the committee before granting the company any further privileges. If the inquiries shall show that its proceedings have been a fraud upon investors and the public, remedial legislation should be reported. If the company emerges from the scrutiny with a clean bill of health, its request for an increase should be denied, because its alleged project of introducing a long-distance system can be carried out without such an increase. Its last sworn statement of assets shows that its means in hand are ample to meet expenses much larger than the $9,000,000 which is given as the first cost of the proposed extension.

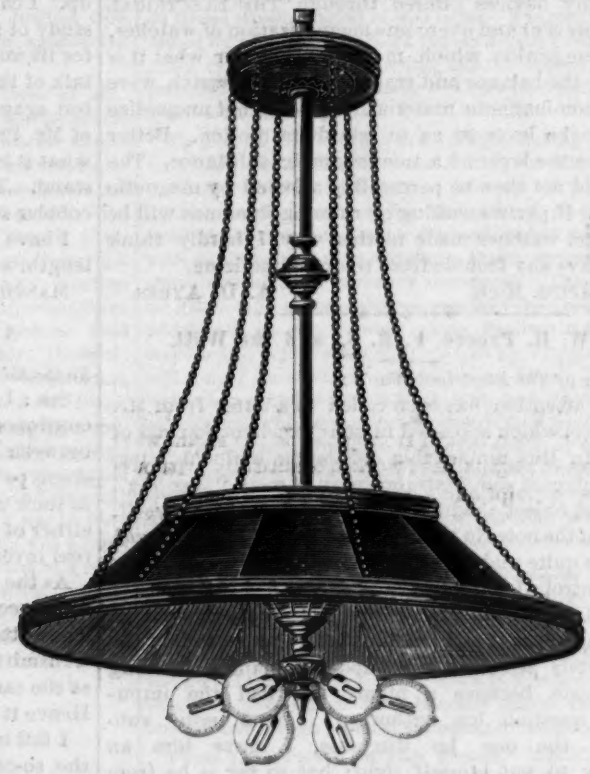
Mr. Lilley asserted that the company when it obtained its last increase promised that the rates should not be raised, but the promise has been broken. The concession to hold a larger proportion of the stock of other companies has resulted in the consolidation with the New England Company and several minor companies, and cost the State $30,000 annually in taxes, which these companies paid, while the consolidated company pays none, although the property is still here with improvements. If the Bell Company should fulfill its threat of leaving the State in case the petition is refused, let it go. Its owners will continue to live here, and their property can then be discovered for the taxation which it now evades. It would have been well if it had never come here, for since this South Sea bubble struck the State not an honest telephone company has been organized—not one whose capital stock was not 95 per cent. water. The influence of these speculative enterprises has been parallel to that of the company presided over by Montague Tigg and immortalized by Dickens.

A Question as to Boilers.

A friend was recently asked the following question: "What form of boiler is cheapest where wood costs less than $1 per cord, and soft coal averages 9 cents per bushel?" The answer was of some length, but not quite as definite as it should have been. Commercially and mechanically the boiler should be the cheapest for a given power and the one which would cost least for repairs. The fuel was too cheap to make its consumption an item worthy of attention. Interest and repairs ought to decide the question regardless of any other considerations. This is a point which our readers who live in cheap fuel regions ought constantly to bear in mind when ordering boilers or engines. Interest and repairs are more important factors in their economy than the fuel account. Electric light men are, however, rapidly learning how to run their engines and boilers economically, yet with increased efficiency.

Reflector for Incandescent Lights.

Incandescent lamps are frequently so placed that their light is effective in but one direction, all rays thrown out in the opposite direction being practically wasted. In order to bring these latter into play, the reflector shown in the accompanying engraving has been devised by Mr. I. P. Frink, of New York. In this the reflecting surface consists of corrugated French glass, upon the back of which a layer of silver has been deposited. This constitutes a highly reflecting surface which, from its nature,



REFLECTOR FOR INCANDESCENT LAMPS.

acts as a diffuser of the light, so that the full effect of the lamps is obtained with an even distribution. The large number of testimonials received by the maker of these reflectors speaks well for their efficiency. They certainly utilize considerable light which would otherwise be wasted.

Electric Lighting in Theatres.

On the occasion of the International Electrical Exhibition at Munich a temporary stage was specially erected at the instance of Baron von Perfall, General Intendant, which was experimentally lighted by electricity in the presence of the managers and directors of the German theatres. This trial, as well as the experiments made by the German Edison Company during nine months at the Royal Residence Theatre, induced the directors of the Royal Court Theatre to intrust the illumination of both theatres to the German Edison Company of Berlin. This new installation is, with the exception of the new electric central stations now in course of erection in Berlin, the largest of its kind in Germany. The machinery by which the current is generated consists of six large Edison dynamo machines, five of which are each capable of lighting 450 Edison lamps of 16 candle-power each, whilst the sixth machine is capable of feeding 250 similar lamps. The latter is chiefly used for lighting purposes during the day. The motive power is supplied by three high-speed compound steam engines, together of about 350 horse-power, and specially constructed for electric lighting. A number of different optical and acoustical controlling apparatus indicate at all times to the attendants the number of lighted lamps, the quantity of electricity supplied by each machine, the intensity of the light emitted by the lamps in the theatre, any faults which may have been caused by damage to the wires, etc. The cables are of 315 square millimetre cross-section, and are first surrounded

with a thick layer of some insulating material, then with a covering of lead, again with a serving of tarred jute, further protected with thick iron wires, and finally with a layer of asphalt. The cables are laid underground at a depth of 1 metre. In the theatres the current is distributed through 2,500 Edison lamps of 16 candle-power each; numerous shunt arrangements are made in order to prevent the heating of the conducting wires. Inside both theatres there are numerous regulating apparatus, which allow of the lamps being gradually or suddenly extinguished or relighted in smaller or greater groups. A rheostat of German silver wire regulates the supply of the current necessary for the degree of light required. The principal regulating apparatus of the Court Theatre is underneath the stage next to the prompter's box. The attendant in charge of the apparatus can overlook the stage from his place, and so observe the effect of his manipulations. For the effective lighting of transparent scenes, etc., the arc light can be substituted behind the scenes direct, without any separate electric machinery being required. The extensive and complicated work of installation was rendered all the more difficult, as it had to be carried out without in the least disturbing the performances at the theatres. We may mention here that on the Continent the theatres at Brûnn, Prague, Stûttgart, the Scala and the Manzoni at Milan, are completely lighted by the Edison glow lamps; and that the installations of the electric light in both royal theatres at Berlin have just been taken in hand by the German Edison Company.

Magnetization of Watches.

To the Editor of The Electrical World:

SIR: Seeing so much written from time to time about it, and so many devices offered through THE ELECTRICAL WORLD to prevent and overcome magnetization of watches, I offer a suggestion which may be taken for what it is worth. If the balance and scape-wheels of a watch were made of a non-magnetic material, they could not magnetize and stick to the lever so as to retard its motion. Better also to make the lever of a non-magnetic substance. The watch would not then be perceptibly affected by magnetic influences. If parties making or running dynamos will be careful to get watches made in this way, I hardly think they will have any trouble from their magnetizing.

CEDAR RAPIDS, Mich. A. D. AYRES.

Mr. W. H. Preece, F. R. S., and the Watt.

To the Editor of The Electrical World:

SIR: My attention has been called to a letter from Mr. W. H. Preece, which appeared in your excellent journal of Jan. 27. In this remarkable epistle the eminent telegraphist indulges in some extraordinary literary "slogging," the apparent object of which is personal damage to myself, the writer of the notes in the Manchester *Mechanical World*, which have quite undesignedly raised his ire beyond the point of control. I should have been gratified if the writer had refuted my statements, or if he had simply shown that I was mistaken; as it is, I am filled with sorrow to find the man of stately presence and imposing manner foaming at the mouth because a pigmy has had the impudence to question his authority. In a note subseqent to the one he discusses, I gave him an opportunity to put himself right; but so far is he from availing himself of the offered chance, that he fortifies himself in the old indefensible position, whence he hurls mud and injurious epithets, the most telling and effective missiles in his arsenal. We have in this country a quasi-legal maxim, "No case, abuse the opposite side," which must have great charms for Mr. Preece. Apart from the unusual material of war employed by him, there is the singular method of its conduct. The *casus belli* arose in England, and there its objective is, but Mr. Preece has delivered his attack in the United States! I suppose this is strategy.

First, in reply as to my style; as a technical journalist of many years' standing, I ordinarily employ the style I think will best answer the purpose I have in view. Thus, if I have an absurdity to deal with, I endeavor to reduce it to itself, and I usually bring into requisition for defense the class of weapon used against me. Mr. Preece's offensive weapons, however, being little to my taste, I shall now bring into action others with which I am more familiar.

He says very elegantly that I have "run amuck on the assumption that the watt is an electrical unit," but he carefully avoids the statement that it is not an electrical unit, and otherwise fails to show that if I assume it to be such a unit, I am in error. He says it is "the unit of power," which is absolutely and unqualifiedly wrong, as every physicist knows. It is used as, and may become with advantage, a recognized *electrical unit* of power, which is a very different thing. I will go further and say that I hope it may also become a mechanical unit, but before this can be, the C. G. S. system must be adopted by mechanics, and I fear that is not likely to occur in our time. The late Sir W. Siemens was the author of the watt, which he introduced to the British Association on Aug. 29, 1882, in company with the joule, and he suggested them as "additional units to those adopted by the International Congress at Paris," so that the list should read: ohm, ampère, volt, coulomb, farad, joule, watt. The gauss was also suggested, but has only been adopted by Professor Sylvanus Thompson. Sir W. Siemens showed that the adoption of the watt would provide a correlative measure between electrical and mechanical units, since it was a fraction or multiple of certain mechanical units. He was a practical mechanician, and therefore knew better than to say it was a mechanical unit.

Now, I come to the actual point of contention, and in order that it may be clearly understood, I will restate it as briefly as possible. Mr. Preece stated that in a given case *n* watts were "expended" or "consumed." I responded that if an F. R. S., speaking to scientists, made such a statement, he evidently did not understand what he was talking about. He responds that his statement is correct, and adds a few definitions with which every elementary student is familiar. "Power is the rate of doing work" is one of them. I will add another, "work is done when a force overcomes a resistance;" and yet another, "in doing work (*i. e.*, in overcoming a resistance) force may be expended;" further, "if the work produces mechanical motion or heat, it is expended in producing that particular mode of motion." Now, according to the doctrine of Mr. Preece, the *rate* of consumption can be consumed! According to accepted doctrines, a thing expended or consumed still exists in another form. The expended force or energy is easily accounted for by its transformation into some mode of motion, but will Mr. Preece account for the expenditure or consumption of the *rate* of an expenditure?

He affirms and reaffirms that the phenomenon exists, but refrains from showing it to us. He says that *n* watts are expended or consumed where ordinary mechanics believe that the exact opposite occurs; that is to say, in a burning candle, for example, *n* watts are originated or set up. I can only suppose that Mr. Preece, coming to the study of the question late in life, with inadequate leisure for its mastery, has got very confused, or he would never talk of the expenditure or consumption of a rate. I protest again, as I protested before, against the efforts of men of Mr. Preece's experience, who seek to interfere with what it is no discredit to them to say they do not understand. That is an admirable proverb which bids the cobbler stick to his last.

I have to apologize for having written at such great length, and for obvious reasons subscribe myself R.

MANCHESTER, Eng., Feb. 17.

A Combined Diplex and Duplex System.

To the Editor of The Electrical World:

SIR: I have been considerably interested in the friendly controversy which has been carried on in your columns between "Reviewer" and Messrs. Terry and Finn, and it seems to me that the particular duplex system referred to in their communications has not been properly named by either of the correspondents. Nor have they disclosed the real inventors.

As the system provides for the transmission of two simultaneous communications from one terminus to another, it is in this respect a "Diplex;" and as messages may be transmitted from each home station to each distant station at the same time without interference, it is a "Duplex." Hence it is a combined Diplex and Duplex system.

I fail to find anything connecting it in any manner with the so-called "Stearns duplex," as it is simply a combination in one circuit of the double current method and the simple closed circuit method of single transmission, the latter being accomplished in this instance by the cutting into and out of the circuit of a definite resistance; and it is this feature which preserves the continuity of the circuit and makes the system operative with a battery at the pole-changing terminus only.

The inventor is none other than Mr. Thos. A. Edison, who patented it in 1873, and I have always understood that it led him directly to the invention of the famous quadruplex shortly afterward.

Mr. Gerritt Smith modified Edison's arrangement slightly when used by the Western Union Telegraph Company, by placing the neutral relay at one station in the circuit of the pole changer, so that while the main battery is reversed, as far as the line is concerned, it always presents the same pole to the relay helices and traverses them in the same direction. This modification is ingenious and doubtless advantageous in some cases, but the system works as well as two single circuits with the neutral relays in the line circuit, providing that their cores are capable of rapid charge and discharge.

I have often wondered that a system so convenient and available for so many uses is not more generally used by the Western Union Telegraph Company.

BOSTON, Mass. JOHN C. WILSON.

The Chesapeake & Potomac Company.—This company, one of those in which the American Bell has a stock interest, is said to be earning 4 per cent. upon its capital of $2,650,000, or something over $100,000 net per year, but will defer payment of dividends until the first quarter of 1886, in order that it may apply present earnings to underground construction. It has some $30,000 more of this work on hand, and a debt of about the same amount. These expenses met, one of the directors says, the company hopes to begin paying 6 per cent. on the stock. The stock is quoted 50 bid, 60 asked, with no transactions. The company controls for telephone purposes the State of Maryland and the District of Columbia, with exchanges in Baltimore, Washington, Cumberland, Emmittsburg, Frederick, Hagerstown and Westminster, Md.

WESTERN NOTES.

THE ELECTRICAL WORLD BRANCH OFFICE,
CHICAGO, March 19, 1885.

Another good result of the electric light convention is the formation in Chicago of a local electric light association, whose purpose is to hold occasional meetings for the discussion of subjects proper to be brought before such a society. A charter has been received from the Secretary of State, and the matter has now gone so far that there is no question of its taking permanent form. If such local associations should be formed at every electric light centre in the United States and Canada, and should have frequent meetings during the year, the vexatious questions which are sure to come up at the next National Electric Light Association meeting would be handled in a very thorough manner. The corporate name of the new society is the Chicago Electric Light Association.

In my report of the Electric Light Convention, I unintentionally did Mr. Haskins injustice. Speaking on the subject of special insulation, he stated that what was not to be had, yet much to be desired, was an insulation combining at once flexibility, non-inflammability, and being thoroughly waterproof as well. Two of these qualities were omitted in the haste of making up the report, which placed Mr. Haskins in the equivocal position of virtually saying that no waterproof insulated wire existed, a proposition which no one who heard his remarks could attribute to a gentleman of his knowledge and experience.

The electric light engine seems to be the engine which is selling just now. While makers of engines adapted only for general work report business as ridiculously slow, the manufacturers of fast automatic, compact engines find the pages of their order books presenting a very satisfactory showing. It may be remarked in this connection that the Westinghouse people alone sold sixty-seven engines in January. Besides furnishing a large number of engines for private plants, the following public stations in the West either now have or soon will have engines of this make: Newton, Ia., 35 H. P.; Springfield, O., two engines of 60 H. P. each. These are for the Champion Electric Light Company. Port Huron, Mich., for the Excelsior Electric Light Company, 60 H. P.; Omaha, Neb., for the Northwestern Electric Light and Power Company, 45 H. P. The New York Safety Steam Power Company, from their Chicago office, are also enjoying a nice business, and are just sending out two engines for electric lighting purposes, and a new Porter-Allen engine is just going into Rand, McNally & Co.'s place here. Engine-makers appreciate the fact that the electric light engine is the most salable just now and that the demand is likely to hold up, for it will be noticed in passing through the various shops that many of them are working on something to adapt their engines to electric lighting use.

Mr. B. A. Boyd, special agent of the American Bell Telephone Company, was in the West last week. He will make a tour over the properties of the Missouri & Kansas and United Telephone companies. Mr. Boyd is a very pleasant gentleman, as well as an energetic business man.

Several agents selling transmitter "resonators" recently invaded the territory of the Missouri & Kansas Telephone Company, but soon sought other fields, as subscribers did not seem to take kindly to the new instrument.

A bill has been introduced in the Missouri Legislature making telephone rates in cities over fifty thousand $40 per annum.

Detroit, Mich., has asked the Western Union Telegraph Company to go underground, and the company is waiting to see whether the city really means it or not.

The Parker-Russell Mining and Manufacturing Company, of St. Louis, are going into the manufacture of electric light carbons on an extensive scale. They have been making and selling carbons in a small way for some time, but after getting into their new factory, about May, they expect to be able to fill orders for carbons in large quantities.

It is reported that a new stock company is soon to be formed here for the purpose of manufacturing a new system for operating incandescent electric lights at long distance from the power. This system is the invention of Harold P. Brown, electrical engineer, and the incorporators of the proposed company comprise prominent capitalists of Chicago and Boston.

Mr. G. E. Simpson, superintendent of telegraph of the Chicago, Milwaukee & St. Paul Railroad, paid Chicago a visit recently.

Mr. J. C. Neville, secretary and treasurer of the Walworth & Lawton Manufacturing Company, of South Bend, Ind., was in Chicago recently, and favored this office with a call. Mr. Neville reports the prospect of trade as very satisfactory for the coming season in his line—cross-arms, poles, pins and brackets.

If the telephone subscribers in a certain Western city will pick up the directory of the local telephone company and turn to one of the advertising pages, I am informed that they will find a piece of blank paper pasted over a portion of that particular page, and the circumstances in regard to the matter as related to the writer are as follows: The local telephone company, when about to issue a new directory, sent out canvassers to solicit advertisements for the book. Some time after the directory was published and

distributed to the subscribers. It was discovered that the advertisement of a mechanical telephone was contained on one of the advertising pages, whereupon all the books were called in, it is alleged, and a piece of white paper neatly pasted over the offending advertisement, and the books redistributed in this condition. Although the price which was to be charged for the insertion of the advertisement has never been collected, yet the mechanical telephone people have placed the matter in legal hands, and a very interesting suit seems likely to be the outcome of the matter.

The Thomson-Houston electric light plant at Atchison, Kansas, is now 75 lights, the plant having been increased by the addition of a 25-light machine.

An electric rat trap, by a Chicago inventor, is the latest out this way, so far as the returns are in. The electric current simply releases an imprisoning drop, and does not, as might be supposed, burn the rat to a cinder on the spot. This arrangement, however, seems to us even worse for the rat than as though it was the current itself that he needed to be wary of, for in the latter case, if he was anything of an electrician, he might perhaps devise means for protecting himself from danger by erecting a lightning rod on his back, or by hanging a lightning arrester to the end of his tail, or by wearing insulating material on his feet, in which case it might be possible for him to walk around inside the trap with the greatest impunity; but with the present arrangement he has absolutely no chance whatever if he desires to pursue his regular line of business and endeavor to eat the tempting cheese.

The *Jewelers' Journal*, of this city, is dissatisfied with Chicago's time service, part of which is obtained over the Western Union wires from Allegheny Observatory, and part from Dearborn Observatory in Chicago. The *Journal* thinks that the railroads, jewelers, and all persons desiring a satisfactory time service could obtain such a service from Dearborn Observatory, and that the institution should be properly compensated for furnishing the time.

Some one has been peddling tickets among the West Side subscribers of the Chicago Telephone Company for a "grand ball to be given by the telephone employés for the benefit of W. C. Brown." The telephone company is out in a card denouncing these persons as frauds, as no one by the name of W. C. Brown is in the employ of the company, and no ball is contemplated by the employés.

The Chicago & Milwaukee Telegraph Company does business on a plan which certainly ought to be satisfactory to its patrons, who, however, are nearly all stockholders. The company owns two wires between Chicago and Milwaukee, and does a very large business between the Boards of Trade of the two cities. It charges its patrons a nominal tariff of ten cents for ten words, and at the end of every month, after deducting expenses and laying aside a small surplus, the balance of the profits are divided among the customers in the shape of rebates which are in proportion to the amount of business done by each.

Superintendent of Telegraph Hood was horsewhipped on one of the principal streets of Vincennes, Ind., March 13, by a woman who claimed that he had talked about her.

Oshkosh, Wis., is to have 50 arc lights within thirty days, as is also Terre Haute, Ind. The Janesville, Wis., plant was started on the 9th inst., with very satisfactory results, and the Streator, Ill., plant, just started, is also doing nicely. These are all Thomson-Houston lights.

I notice that the Baltimore & Ohio Telegraph Company is anxious to be put on an equal footing with the Western Union Company as regards the transmission of business over the lines of the Union Pacific Railway Company. Evidently the Baltimore & Ohio Company is about to follow Horace Greeley's advice to young men, and "go West."

THE TELEGRAPH.

Organization Among Operators.—The headquarters of the Grand Council of the Telegraphers' Protective Union has been located in New York. The work of organization of new unions in the East, the South, and the Dominion of Canada will be conducted from that point. The work of organizing the Western cities will be under the charge of the Chicago organization.

An Operators' Strike.—The Bankers and Merchants' operators in this city have left their keys rather than accept a compromise of 70 per cent. of the salary due to them from the company. The strike extends to Buffalo, Chicago, Boston, Pittsburgh, Richmond, Norfolk, Baltimore and other cities, and the operators, who have stood by the company for months past, getting little or nothing, have the full sympathy of the community.

Edison in Florida.—Edison is still in Florida. His first notion that alligators were to be caught with a trout-hook and a worm has been rudely dispelled, and he is now contriving an electrical bob for their capture. In a recent letter he says: "But I am giving most of my attention to solving the great orange problem. My folks there always pay about sixty cents a dozen for them, but the producer here gets only fifty cents a box for them delivered in New York. Why is this thus? is the question in political economy I am bound to solve even if I have to sell the season's crop short."

Tubes Between London and Paris.—The plan to connect Paris and London with pneumatic tubes has been reported favorably by French engineers and submitted to the government. It is proposed that two pneumatic tubes be laid following the line of the Northern Railway from Paris to Calais, thence across the channel to Dover, and following the line of the Southeastern railway to London. Letters could be thus transmitted between the two capitals in one hour. Wagonettes likes those now used to transport telegrams from Paris are to be used, weighing ten kilogrammes and capable of carrying five kilogrammes weight of mail matter. Twenty pneumatic trains are to be started every hour. The cost is estimated to be $7,000,000. The total distance is 475 kilometres (about 300 miles).

Southern Telegraph Company.—A dispatch of March 10 from Atlanta, Ga., says: "In the Southern Telegraph Company case, heard before Judge Boardman, of the United States Court, this morning, the causes of Mahone & Lochrane vs. The Southern Telegraph Company were consolidated, and the same receiver was appointed that had been appointed in Virginia. The decree requires him to give bonds for $50,000. Notice of all further motions and orders, as well as disposition of property in this jurisdiction, is to be given to Judge Lochrane, who becomes by this consolidation company plaintiff with Senator Mahone."

The Rapid in Boston.—Daniel S. Robeson, a stockholder in the American Rapid Telegraph Company, in behalf of himself and other stockholders similarly situated, has filed a bill in equity in the United States Circuit Court in this city against the company, Anthony W. Dimock, and others, charging that the defendants have made undue preferences and created liens on the property and assets of the company in favor of the Bankers and Merchants' Telegraph Company, and asks for an accounting between the two companies and the appointment of a receiver of the American Rapid Telegraph Company. A restraining order has been issued by the court.

Muirhead vs. the Direct United States Cable Company, Limited.—The defendant company on Monday, Jan. 18, appealed from the decision of Mr. Baron Huddleston, declaring the company liable for the rent of the plaintiff's duplex system of telegraphing for a certain period during which, in consequence of defects in the cables, the system would not work. Having heard the arguments of the counsel for the defendants, that the cables, though slightly defective, would yet carry messages on the simplex system, the master of the rolls expressed himself clearly to the effect that the fault was in the company's cable and not in the duplex system, which was now as good as ever, and held that Mr. Baron Huddleston was right in his decision. Lords Justices Cotton and Lindley concurred, and judgment was given against the appellants.—*London Electrical Review.*

The Postmastership of New York.—The term of Mr. Pearson, postmaster of New York, is just expiring, and though he has proved most efficient and capable in office, strenuous efforts are being made in some quarters to prevent his continuance in office. One of the charges brought against him is that he was one of the incorporators of the Manhattan District Telegraph Company, with W. H. Woolverton, of the New York Transfer Company, and A. S. Dodd, secretary of the Metropolitan Telegraph and Telephone Company, and that the company's business was in part that of a private post-office, affecting injuriously the revenues of the U. S. Post-Office. Even if the business were illegal, Mr. Pearson's explanation clears him thoroughly. He says: "In the beginning of October, 1882, William H. Woolverton, president of the New York Transfer Company, and A. S. Dodd, secretary of the Metropolitan Telegraph and Telephone Company, both personal friends of mine, called on me and asked, as a matter of personal accommodation to them, that I, with them, should sign letters of incorporation of the Manhattan District Telegraph Company, and the understanding was distinct that I was to have no interest in the company whatever. The proceeding was merely formal. This occurred on Oct. 12, 1882. In the course of a week or two, on receipt from the Secretary of State of papers confirming the organization, I formally transferred all my possible interest in the company, and that act terminated my connection with the Manhattan Company."

THE TELEPHONE.

Bell Dividend.—The American Bell Company has declared its regular quarterly dividend of 3 per cent., payable April 15, books closed March 29 to April 12.

Salt Lake Murmurs.—Notice has been issued to subscribers at Salt Lake City that after April 1 the cost of service at private residences will be increased $3 per quarter. The local *Herald* "believes it is doing a friendly act to the telephone company when it warns it against persisting in the threatened increase of rates," as the people "will not submit to the extortion."

Michigan.—With the opening of spring the Michigan Bell Telephone Company will begin the erection of new lines. The people of Brooklyn wish connection, and we learn that the cottagers and proprietors at Sand Lake wish a line erected giving them connection with the State line. The telephone has become a necessity, and business could not be carried on without it. Recent changes have greatly improved the service, and so far as we can learn there is general satisfaction. On the 1st of March a new tariff went into effect which cheapens the trunk line service in many instances. The company seem to make every effort possible to increase the usefulness of the telephone, and are expending large sums of money to bring it to perfection.—*Manchester Enterprise.*

Must Not be Taken Out.—Charles Gibbons, Jr., a lawyer, whose office is at No. 230 South Third street, Philadelphia, has filed a bill in equity against the Bell Telephone Company to prevent the removal of his telephone. Mr. Gibbons has had a telephone for over three years under the customary contract. He paid an annual rental of $100, and the company agreed to give him "efficient telephone service." About October last his service became defective, and for the five weeks preceding Feb. 25 he had no use of the instrument at all. When he insisted upon making a proper deduction, the company refused to allow any and threatened to remove the instrument. Judge Biddle granted a preliminary injunction restraining the company and its employés from removing the telephone or interfering with its use.

Mexican Telephone Company.—The annual meeting occurs April 8, in New York, the books to close March 21. The Mexican Company is practically out of debt, but finds construction expenses eating up the profits. The Mexican Central Telephone Company, one of the best sub-companies in Mexico, finds itself $20,000 in debt, the note bearing 5 per cent. interest, and $6,000 of the amount falling due April 11 next. The holders of the note have agreed to accept stock of the company at $2.30 per share in liquidation of the same. Stockholders have been invited to subscribe one-eighteenth of their holdings for this purpose, and already some 40,000 or 45,000 shares have assented, practically insuring the success of the plan and freeing the company of debt. The company has five exchanges in Guanajuato, San Luis Potosi, Zacatecas, Queretaro and Aguas Calientes. By the last report, nearly a year ago, the company had 316 paying subscribers and 400 sets of instruments. The annual report next month is expected to show an increase. It is understood that a new board of directors will take charge of the property in April, including experienced telephone men.

THE ELECTRIC LIGHT.

New Orleans Exposition.—It is stated that the electric light of the Exposition costs the management about $1,250 a day.

Thomson-Houston Notes.—The Thomson-Houston system has been adopted for Newport, R. I., and the citizens are delighted with the continued use of electric lights.

New Orleans.—The contract of the Brush Company with the city of New Orleans, calls, it is stated, for 113 lights of 2000 candle-power each, to burn every night in the year, for the sum of $16,019.56 to the end of 1885.

Fatal Accident.—A dispatch of March 9, from Cincinnati, O., says that while a man was attending to some repairs on the roof of the Gibson House, in that city, he caught hold of an electric light wire, and was instantly killed by the shock.

Elmira, N. Y.—The new station of the Electric Light & Power Co., operating the Weston system, has been opened for business. The plant is complete in every respect. The equipment consists of four Skinner & Wood (Erie, Pa.) boilers of 100 H. P. each, two Buckeye automatic engines 150 H. P., coupled, and Weston dynamos running 400 incandescent lamps at present. The ultimate capacity will be about 3,700 lamps.

The Mills Building, New York.—The large and fine isolated lighting plant of the Edison system in the Mills Building, on Broad street, consists of 800 lights. The motive power is furnished by a pair of New York Safety Steam Power Company's engines, cylinders 10 × 12, running 323 revolutions per minute. The plant has been very satisfactory in operation and is entitled to be called a model of its kind.

To Aid in Building a Railway.—Among the various materials ordered by Messrs. Lucas & Aird for the construction of the Suakim-Berber Railway, are two sets of portable electrical lighting plant. Each of the two sets of plant will comprise a small locomotive boiler and a Parsons patent high-speed engine, with a six-light Anglo-American Brush dynamo-electrical machine, with all other necessary accessories. This machinery will be fitted into a four-wheeled specially-designed railway wagon, which will be run forward along the lines of the railway as its construction is proceeded with. From the dynamo machine cables will convey the electrical current to six Brush lamps which will be fixed on portable tripods 35 ft. high, and placed along the side of the portion of the line under construction, at distances of about 100 yards apart. By these means the work of construction cannot fail to be very much accelerated, as the contractors will be enabled to carry it on all night through when the temperature is at the lowest and most suitable for working, while in the daytime during summer such work would be absolutely impracticable.

MISCELLANEOUS NOTES.

The Canadian Patents.—The Dominion Telephone Company having obtained the annulment of the Bell patent in Canada, have instituted proceedings for a like end against the Blake, Phelps, Anders and Edison patents, belonging to the Bell Company there.

Pyro-Electricity of the Topaz.—MM. C. Friedel and J. Currie have sent a note to the Academy of Sciences, Paris, on the pyro-electricity of the topaz. From their experiments they conclude that the crystals of the topaz possess not only the already determined pyro-electric vertical axis parallel to the axis of the prism, but also a horizontal axis of pyro-electricity, present at least in some specimens examined by them. Owing, however, to the limited number of these specimens, it was impossible to define clearly the position of the horizontal axis. The intensity of the electricity developed varied with the specimens themselves.

Effect of Discharge on Glass.—A singular effect of the electric discharge has been noted by E. Villari. Strong, thick glass plates are easily broken by the spark from a Leyden battery if they are silvered only on one side. The same physicist believes that the ramifications observed in the dust figures of electric condensers are due to partial internal discharges. In making microscopic researches on the traces of electric sparks engraved on glass he has observed that these sparks vary with the glass, not with the nature of the electrodes; that they are not removed by acids, and they are probably caused by heat. Tinted zones are produced on the surface of the glass where these sparks have passed. The cross-section of the spark is for a constant potential, proportional to the charge which produces it.

APPLICATIONS OF POWER.

Blackpool, Eng.—In order to be ready for the approaching season, the directors of the Blackpool Electric Tramway Company have engaged a large body of men to lay the rails along the promenade.

An Electromotive Gas-Lighter.—The covered street at Milan, now well known as the Victor Emmanuel Gallery, is roofed with glass and completed by a large dome, around the interior of which runs a chain of gas lamps. The lighting of these lamps at a considerable elevation used to present some difficulties, and was always a source of risk until an arrangement was made for doing the work by electricity. A miniature railroad has been constructed close to the gas-burners, on which runs a little electric locomotive, carrying a wick steeped in spirits of wine. When it is desired to light the burners, this wick is set on fire and the locomotive started on its career. It flies round, rapidly kindling the circle, and exciting great interest among the crowds that assemble to witness the performance.

A Large Prize Offered.—The Paris Academy of Sciences

proposes for competition in 1886 the subject of the improvement in some important point of the theory of the application of electricity to the transmission of work. The prize is a medal of the value of $750, and the essays must be filed not later than June 1, 1886.

STOCK QUOTATIONS.

Telegraph, telephone and electric light quotations on the New York Stock Exchange, Boston Exchange and elsewhere are as follows:

Telegraph.—Am. Cable, b 53, a 56; B. & M., b 2, a 3; Mutual Union, b 14, a 16; Postal stock, b 2, a 2¾; Postal sixes, b 19½, a 20⅛; Western Union, b 58¾, a 58⅞.

Telephone.—Am. Bell, b 219, a 220; Erie, b 21½, a 21¾; New England, b 28½, a 29; Mexican, b 1⅝; Tropical, b 1¼.

Electric Light.—Edison, b 50, a 67½.

BUSINESS NOTICES.

"How To Keep Boilers Clean."—This is the title of a neat little pamphlet issued by Mr. James F. Hotchkiss, of 80 John Street, New York, being an illustrated description of the Hotchkiss Mechanical Boiler Cleaner, which has been found so useful by steam users and engineers. Briefly described, it has two pipes reaching the water, the shorter one having a funnel at the surface. When steam is up, its pressure forces the water up into the ball with which the pipes are connected, until the ball is full. The water being away from the heat is cooler than the water on the surface in the boiler; and as it seeks to come down the longer pipe a steady circulation is kept up. In its passage through the ball, the water deposits there its impurities, which are easily blown out whenever necessary. The boiler is kept very clean by this means. A large number of these cleaners are in use. The cleaner is now on exhibition at New Orleans.

Fell's Cylinder Relief Valve.—This valve, manufactured by the United States Steam Specialty Company, 46 Cortlandt street, is suited to all kinds of marine, stationary and locomotive engines, relieving them from water and friction, saving fuel, insuring safety, preventing packing from blowing, and avoiding constant repairs. Messrs. Hyde & Behman, of Brooklyn, N. Y., who have an electric light plant for their well-known place of amusement there, say, under date of Jan. 15, 1885: "Some five weeks since Fell's cylinder relief valve was attached to our electric light engine as an experiment, your agent representing to us that we would find a marked improvement from its use. We, having given it a thorough trial, take pleasure in giving it an unqualified indorsement. Our lights are steadier, our engine runs more smoothly and almost without noise, and by this improvement we have been enabled to add extra lights where previously our engine power was taxed to the utmost. These facts demonstrate to our entire satisfaction its efficiency and value. Hyde & Behman." Other testimonials are equally warm in their praise.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

PATENTS DATED MARCH 3, 1885.

Electric Circuit; Henry F. Campbell, Concord, N. H. 313,053

Consists in connecting together at their ends the anti-inductive shields of two independent cables, and it further consists in connecting the telephone or other instrument in circuit between one of the independent wires of the cable and the shield of the said wire or cable, by which arrangement he finds that the retardation and disturbances arising from earth currents become less than when the circuit is completed between the ends of the shield and of the inclosed wire by the ground in the manner usually practiced.

Electrolytic Signal for Storage Batteries; Willard E. Case, Auburn, N. Y. 313,058

Consists of a mixture of liquid normally containing zinc sulphate and aluminic hydrate. The action of the chemicals upon the zinc electrode is prevented, so that it need not be amalgamated.

Automatic Cut-Outs for Electric Circuits; John B. May, Watertown, Wis. 313,091

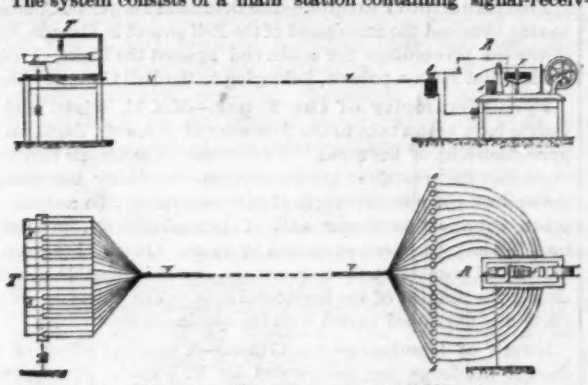
A drop is freed by an abnormal current and the said drop closes a local circuit which pulls downward, through magnetism, a spring. This latter movement breaks the ground circuit and makes a new circuit to the ground, not including translating devices.

Apparatus for Charging and Discharging Secondary Batteries; William Stanley, Jr., Englewood, New Jersey 313,117

The apparatus is so constructed and arranged that when no current is passing through the working or discharging circuit the battery *Y* and working circuit will be wholly disconnected from the main or charging circuit. On the other hand, the battery and working circuit will be thrown into the main or charging circuit when the translating devices or any one of them is thrown into circuit with the battery, and whenever the battery on being connected with the main circuit is not fully charged it will remain connected with the charging circuit until it becomes fully charged, or until the lights or other translating devices are thrown out of circuit, when the battery and working circuit will be disconnected from the charging circuit whether the battery is fully charged or not. From what has been stated it will appear that the battery can never become fully charged except when it has a path of discharge ready through the working circuit. There may be any number of batteries connected so as to be charged from a single generator, and each battery may consist of any number of elements, which are arranged, as shown in the drawings, so that the battery shall be thrown into or out of the charging circuit cell by cell, or a few cells at a time. The patent includes eleven claims.

Municipal Telegraph; John C. Wilson, Boston, Mass., Assignor to the Municipal Signal Co., Portsmouth, N. H. 313,147

The system consists of a main station containing signal-receiving apparatus and a multiple signal device, combined with a main line or circuit leading from said station, and signal boxes or substations thereon containing signal-transmitting and signal-receiving devices whereby different definite signals may be automatically transmitted from the main to the sub-stations, and the reverse.



PRINTING TELEGRAPH. 313,175.

Printing Telegraph; Gilbert A. Cassagnes, Paris, France 313,175

Figs. 1 and 2 show a transmitter and key-board. The transmitter is separated entirely from the printing apparatus, to which it is only electrically connected—*i. e.*, the two essential parts of the machine are placed, one at the transmitting station *T* and the other at the receiving station *R*. Each key *k* of the transmitting key-board closes, when depressed, a circuit which transmits through the cable or line *V* a signal received and printed at the receiving station by the style *F* corresponding to the depressed key. This letter or sign is put in motion by an electro-magnet *L*, acted upon either directly by the line circuit, or by means of a local circuit controlled by a relay *S*, arranged according to the well-known disposition of these apparatus. The motion forward of the slip of paper to be printed upon can also be produced by means of a special electro-magnet *A*, placed in a local circuit, which is closed by the action of any one of the printing electro-magnets.

Printing Telegraph; Gilbert A. Cassagnes, Paris, France 313,176

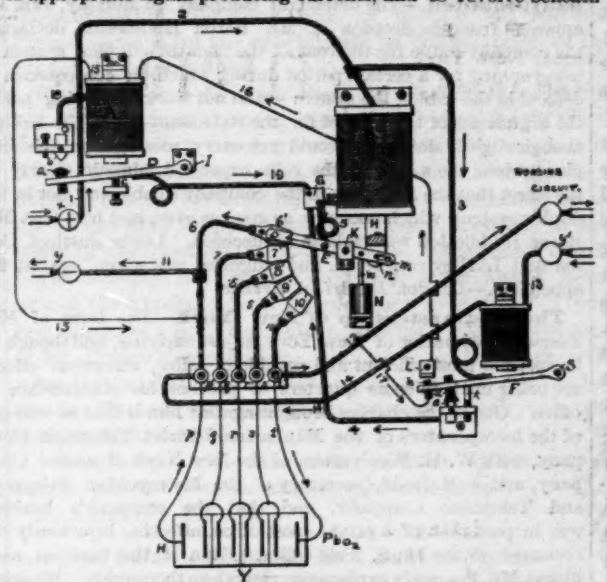
Consists of apparatus for the automatic and electrical transcriptions of conventional signs or combinations of signs forming a stenographic alphabet into ordinary letters, which apparatus embraces the combination of the keys, combiner, having printing electro-magnets and styles, and batteries.

Regulator for Electro-Dynamic Motors; Frank J. Sprague, New York, N. Y. 313,247

Consists of a method of regulation for an electro-dynamic motor whose main field-coils are in shunt relation to its armature, which consists in strengthening the magnetizing effect of the field-magnet coils of the motor to decrease the mechanical effects, as speed or power, or both, and, vice versa, weakening such magnetizing effect to increase the said mechanical effects.

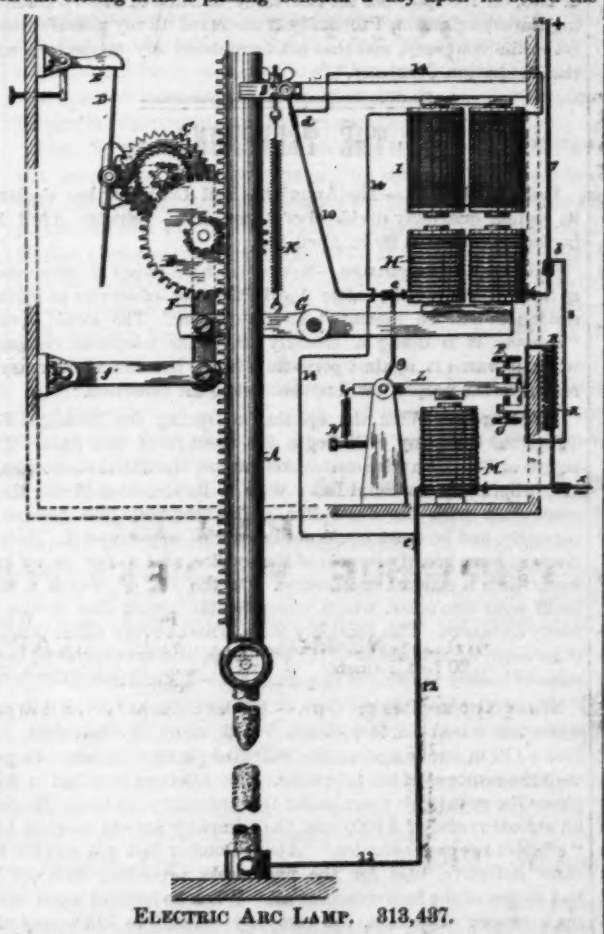
Multiplex Telegraph; Chas. G. Burke, Richmond Hill, N. Y. 313,298

He employs two or more key-boards, each of which is constructed with an annular series of keys for occasioning the transmission of appropriate signal-producing currents, and to revolve beneath



APPARATUS FOR CHARGING AND DISCHARGING SECONDARY BATTERIES. 313,117.

each series of keys a circuit-closing arm which, when passing any depressed key, causes an impulse or group of impulses to be transmitted which will correspond to the signal desired to be produced, and will have a characteristic depending upon the key-board upon which the key is located. For the purpose, however, of preventing two impulses or groups of impulses from being thus simultaneously transmitted, it is necessary that the keys upon the different key-boards should be so located with reference to their circuit-closing arms and to each other that at the moment any one of the circuit-closing arms is passing beneath a key upon its board the



ELECTRIC ARC LAMP. 313,437.

other circuit-closing arms shall be passing across the spaces intervening between two keys of their respective key-boards.

Electric Cable; William H. Eckert, John A. Seely, and Edward A. Eckert, Cincinnati, O. 313,305

In cities, where the cable is often carried over the tops of buildings, direct ground-connections cannot be made at even approximately regular intervals. By the present invention they dispense with the direct earth-wires by connecting the induction-core of the cable at regular intervals with the supporting rod or wire, the latter being grounded at each end.

Automatic Electrical Cut-Off; Edward Gannaway, Nashville, Tenn. 313,313

This invention has relation to automatic water cut-offs which are designed for cutting off the water from the house at a point in the ground below the freezing-point by mechanism operated by an electric battery, which is automatically controlled by a thermal gauge.

Clamp for Binding Wires to Insulators; W. H. Sawyer, Providence, R. I. 313,377

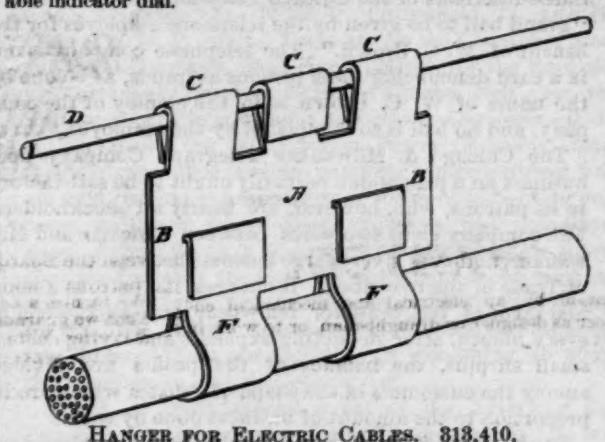
Consists of an arch-shaped bar of iron, having at its ends, on one side thereof, circular discs with circumferentially grooved peripheries, forming wire seats.

Electrical Conductor; Sidney F. Shelbourne, New York, N. Y. 313,380

Consists of a flexible electric conductor composed of the following elements: A copper core of several small wires forming a rope conductor, an insulation about the same formed of multiple windings in bulk, of jute or other fibre saturated with a melted insulating material, a braiding of fibre inclosing such insulation, and a jacket or tubing of lead inclosing and protecting the whole.

Electrical Indicator for Pool Tables; Elias Curtis, Kansas City, Mo. 313,404

The object of the invention is to provide a simple and efficient indicator for pool tables, so that the person in charge of one or more tables may be immediately informed of the commencement of a game, and of the particular table upon which it is to progress. The invention consists in constructing the spot and triangle of metal, and placing them in electrical communication with a suitable indicator dial.



HANGER FOR ELECTRIC CABLES. 313,410.

Hanger for Electric Cables; William H. Eckert, John A. Seely and Edward A. Eckert, New York, N. Y., Assignors to the American Bell Telephone Co., Boston, Mass. ..... 313,409 and 313,410

The first consists of the combination, with a telephone station apparatus, of a switch consisting of a movable plate carried by a receiver and supported in front of the ear-piece thereof, and contacts and connections arranged so that said switch is shifted to connect in the telephone apparatus by application of said receiver to the ear. The second consists of a body portion having slots *B*, arms *C*, projecting from one side of the body portion, and arms *F*, projecting from the other side of the said body portion and adapted to be bent up and passed through the slots.

Electric Arc Lamp; C. Odilon Mailloux, New York, N. Y., Assignor to the Thomson-Houston Electric Light Co., Boston, Mass. 313,436

Consists of the combination, in an electric-arc lamp, of a feed-regulating armature or lever supporting the electrode, and actuated in opposite directions by current in a derived circuit of high resistance and by a suitable retractor, a starting coil or circuit, and a circuit-controller for throwing said starting-coil out of action and holding it out of action while the lamp continues in operation, said controller being energized by reason of the circuit established by the coming together of the carbons.

Electric Arc Lamp; C. Odilon Mailloux, Brooklyn, N. Y., Assignor to the Thomson-Houston Electric Co., Boston, Mass. 313,437

At *f* is shown a parallel motion link, which is intended to cause the pinion engaging with the carrier to move in a straight vertical line when the point of support for the frame *F* moves in a circle. The electro-magnet *H* is attached to the lever *G*. Its object is to act as an auxiliary supplemental magnet. When no current is passing in its coils, its core is the simple armature for the electro-magnet *I*, which is the usual derived circuit magnet of an electric lamp, and acts; when the arc becomes abnormally long, to tilt the lever *G*, and by disengaging the fly *D* and detent *E*, to allow a feed of the carbon to take place. *L* indicates a commutator, which is under the control of a retractor *N*, and a magnet *M* of low resistance, and connected into the carbon circuit in such a way that when a current flows in a normal or greater than normal amount through the carbons, the magnet *M* will be energized, and will hold the switch *L* against a contact stop *O*. When, however, there is no current through the carbons, or when the current becomes abnormally weak, the spring *N* will hold the switch against the contact stop *P*, the magnet *M* not being then sufficiently strong to overcome the force of the retractor *N*.

Telegraphic Apparatus; Charles W. Williams, Cave City, Ky., Edward B. Ives, New York, N. Y., and George S. Barnum, Atlanta, Ga. 313,462

Consists of two main-line wires, branching from the same pole of a local galvanic battery, and grounded at the opposite end to complete the circuit, said wires running along parallel to the rails of a railway-track and divided into suitable sections, and provided at each intersection with a switch-connection for breaking and closing the circuit at such intersections, and a railway-car on the track, with suitable means for establishing and maintaining constant electrical connection between said wires through an instrument on the car, also with suitable means for automatically operating said switches by the movement of the car to open an existing closed connection and close an existing open connection at the intersections passed over by the car, whereby the current is conducted through the car from one wire to the other constantly as the car moves along the track.